PROCEEDINGS

Fifty-Eighth Annual Convention
OF THE
American Railway
Bridge & Building Association

1953

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Proceedings of the

Fifty-Eighth Annual Convention

of the

American Railway
Bridge & Building
Association

Held at

CHICAGO, ILLINOIS

September 15-17, 1953

Published by the Association
Elise LaChance, Secretary
431 So. Dearborn St., Chicago 5

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Lee Mayfield ..... First Vice-President
Missouri Pacific, Houston, Tex.

H. M. Harlow ..... Second Vice-President
Chesapeake & Ohio, Richmond, Va.

J. A. Jorlett ..... Third Vice-President
Pennsylvania, New York

R. R. Gunderson ..... Fourth Vice-President
Western Maryland, Baltimore, Md.

Elise LaChance ..... Secretary
431 S. Dearborn Street, Chicago

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G. Switzer, Western Pacific ..... Sacramento, Cal.

Past President

Guy E. Martin, Illinois Central ..... Chicago, Ill.

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F. R. Spofford, Boston & Maine ..... Boston, Mass.

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PROCEEDINGS

This section contains a running account of the activities during the three-day annual meeting in 1953; brief abstracts of the addresses read to the joint session with the Roadmasters' Association; and all of the B. & B. committee reports, printed in full, with brief abstracts of the discussions that followed their presentation.

Those present at the 58th annual meeting of the American Railway Bridge & Building Association not only attended an informative meeting, consisting of seven comprehensive committee reports, but also had the opportunity of inspecting a record display of manufacturers' products held at the Coliseum, which was sponsored by the Track Supply Association and the Bridge and Building Supply Association.

Continuing the practice started in 1946, the three-day meeting was held concurrently with, although separate from, the annual convention of the Roadmasters' and Maintenance of Way Association, on September 15-17, at the Conrad Hilton Hotel, Chicago.

Record-Breaking Attendance

Attracted partly by the large exhibition of manufacturers' products, a record number of persons registered at the annual conventions of both the Bridge & Building Association and the Roadmasters' Association. Total registration came to 1364 members and guests of the two associations. This figure included 1071 railway men and 293 representatives of supply companies. The total attendance for 1952 was 873.

Mammoth Exhibit

A wide variety of manufacturers' products and equipment, including many items never before exhibited, were displayed at the Coliseum from September 14 through 17. Every available bit of space was occupied by 126 participating companies, nearly 30 of which were displaying their products for the first time. This was the first exhibit to be sponsored by the Track Supply Association and the Bridge and Building Supply Association since 1950.

Joint Opening Session

The Bridge & Building and Roadmasters' Associations convened in a joint opening session on Tuesday morning, September 15. Principal speakers at this session were H. J. McKenzie, president of the Cotton Belt, and R. G. May, vice-president, Operations and Maintenance Department, Association of American Railroads. Brief words of greeting were also heard on behalf of the American Railway Engineering Association by its senior vice-president, G. W. Miller, engineer maintenance of way, Canadian Pacific, Toronto, Ont.; the Track Supply Association, by President R. W. Torbert, Oxweld Railroad Service Company; and the Bridge and Building Supply Association by President R. R. Clegg, American Lumber & Treating Co. Also a brief speaker at this session was the secretary-treasurer of the Track Supply Association, Lewis Thomas, Q & C Company, who also acted as director of exhibits.

The annual banquet, held on Wednesday evening, September 16, which was sponsored by the two supply associations, was another joint activity in which both associations participated. Attendance at this function, which totaled 1805 persons, including many wives of members, broke all previous records.

Separate Sessions of B. & B. Association

Presiding over the separate sessions of the Bridge & Building Association was Foster R. Spofford, president of the association, and assistant to chief engineer of the Boston & Maine, Boston.

During these sessions much of the time was devoted to the presentation and discussion of seven technical committee reports dealing with the following subjects: Application of Modern Machines and Power Tools to Bridge Maintenance; Selection and Training of Bridge and Building and Water Service Personnel; Programming Repairs and Replacements; Rejuvenation of Safety Meetings; Ventilation and Air Conditioning of Railway Buildings; Conversion of Shop Buildings for Diesel Maintenance and Furnishing Water Under Emergency Conditions.

In addition to the seven technical committee reports, a color motion picture was also presented, showing progress of tests conducted on the Santa Fe in an effort to determine the most effective methods of protecting creosoted timber trestles from fire. This film was accompanied by explanatory remarks by C. H. Sandberg, assistant bridge engineer of the Santa Fe.

Also included in the program of the opening session was the introduction of all past presidents of the association who were in attendance. These were C. Miles Burpee, now Secy.-Mgr. Service Bureau, American Wood Preservers Assn.; R. E. Dove, associate editor, Railway Track and Structures; N. D. Howard, secretary of the American Railway Engineering Association; J. S. Hancock, bridge engineer, Detroit, Toledo & Ironton; E. H. Barnhart, division engineer (retired) Baltimore & Ohio; W. A. Huckstep, general building supervisor, Missouri Pacific; and G. E. Martin, superintendent water service, Illinois Central.

President Spofford's Remarks

The theme of President Spofford's address before the opening session of the B.& B. convention dealt primarily with some of the pressing problems confronting bridge and building men as a result of our changing times. Mr. Spofford pointed out that railroad supervisors, engineers and their associates in the supply industry are working in a difficult period. Practically nothing is static. He indicated that one great change, now in its later stages, is that from steam to diesel locomotives. Mr. Spofford went on to say that "this has resulted in the obsolescence of steam facilities and the requirement for facilities of new types." The last few years also "have seen great developments in passenger cars and trains," he declared, with the probability that "even greater changes impend." "Aside from changed facilities for servicing such equipment it is apparent that a major problem will be to raise the standards of our passenger stations to that of the equipment within the economic limits of the revenue available," he continued.

Mr. Spofford also mentioned the fact that we are on the threshold of a major development — air conditioning. He stated that although it had been used in passenger equipment, stores, offices and plants, only slight application has been made to buildings in the railroad industry. Mr. Spofford indicated a start had been made, particularly in the South, but he believes that we must anticipate widespread application to all parts of the country if we are not to lose our patrons and employees to competitors.

"It may be well said that a large part of all these problems is the responsibility of the designer. That is true, but it is only a half truth," said Mr. Spofford. He feels that no designer can hope to achieve the proper result without both the advice and criticism of the supervisor.

Summing it up, Mr. Spofford said: "The supervisor is then the essential man in the railroad organization for truly economic construction and maintenance practices."

"Our every effort to apply in our work what we have learned, to advise our management and designers as to results of our own experience and that of others, and the development with the supply industry of better equipment and materials must be extended on every occasion. A failure on our part to achieve such an economic result will place a dangerous burden upon our individual railroads and the industry as a whole."

Election of Officers

In the election of officers, Lee Mayfield, resident engineer, Missouri Pacific Lines, Houston, Tex., was advanced from first vice-president to president; H. M. Harlow, assistant general supervisor bridges and buildings Chesapeake & Ohio, Richmond, Va., moved up from second vice-president to first vice-president; J. A. Jorlett, assistant engineer bridges and building, Pennsylvania, New York, was advanced from third vice-president to second vice-president; R. R. Gunderson, bridge and structural engineer, Western Maryland, Baltimore, Md., was promoted from fourth vice-president to third vice-president and W. H. Huffman, assistant engineer maint., Chicago & North Western, Chicago, was elected fourth vice-president.

Directors elected were B. M. Stephens, assistant chief engineer, Texas & New Orleans, Houston, Tex.; W. H. Bunge, assistant engineer, Missouri Pacific Lines, Houston, and E. R. Schlaf, assistant superintendent water service, Illinois Central, Chicago. L. C. Winkelhaus, architectural engineer, Chicago & North Western, Chicago, was re-elected treasurer.

E. H. Barnhart, retired division engineer of the Baltimore & Ohio, who has been one of the Association's most active members ever since he joined in 1941, was elected to honorary membership of the association.

On Thursday afternoon, September 17, those attending the B&B convention had an

opportunity of attending a school at which the principles of making good concrete were discussed and demonstrated. The concrete-making school included the showing of two recently completed films. Instructors consisted of representatives of the Portland Cement Association.

Eight subjects were chosen on which committee reports are to be prepared for presentation at the 1954 meeting. These are as follows: Tunnel Maintenance; Inspection, Repair and Replacement of Culverts; Metal Fasteners in Wood Construction; Cleaning and Painting of Railroad Buildings; Fireproofing of Timber Bridges; Dieselization and the Water Service Man; Organizing for Restoration of Flood Damage; and Trends in Modernization of Freight Stations.

REPORT OF NECROLOGY COMMITTEE

TO THE PRESIDENT AND MEMBERS OF THE AMERICAN RAILWAY BRIDGE & BUILDING ASSOCIATION:

Your committee reports with sincere regret and sorrow that we have learned of the loss of nine members through death during the past year. It is probable that our information is incomplete and that other members have passed away during the year. The following active members have been reported:

NAME	TITLE-RAILROAD	JOINED ARB&B ASSN.	DIED
Active Members			
C. H. Burks	Division Engineer Seaboard Air Line Jacksonville, Fla.	1951	December 18, 1952
F. G. Campbell	Chief Engineer Elgin, Joliet & Eastern Joliet, Ill. 1942-43 Director 1943-45 3rd Vice-President 1945-46 1st Vice-President 1946-47 President	1936	August 22, 1953
A. H. Deno	Bridge & Building Supervisor Chicago & North Western Green Bay, Wis.	1941	(Reported in 1953)
J. L. Dougherty	Supervisor Bridges & Buildings Western Maryland Cumberland, Md.	1944	February, 1952
F. M. Misch	General B.& B. Supervisor Southern Pacific San Francisco, Cal. 1947-48 Director 1948-49 Director 1949-50 Director 1950-51 Director	1937	December 1, 1952
M. M. Warso	Engineer Monongahela Connecting Pittsburgh, Pa.	1948	March, 1952
Life Members			
C. R. Lyman (Ret.)	Foreman Bridges & Buildings Central Vermont Waterbury, Vt.	1913	(Reported in 1953)

REPORT OF NECROLOGY COMMITTEE (Cont'd)

C. U. Smith (Ret.)	Formerly with CMStP&P Consulting Engineer Lindsay, Cal.	1915	February 25, 1952
D. Speaker (Ret.)	Master Carpenter Pennsylvania Steubenville, Ohio	1928	April, 1953

The assignment given to this committee is one of the unpleasant tasks in the association. These reports are always given with a feeling of sadness and sincere loss as we note the passing of fellow members. We respect their memory and express our sympathy to their surviving families. May we pay tribute to them silently for a few moments.

R. R. Gunderson, Chairman
W. A. Huckstep
W. F. Martens
Necrology Committee

SECRETARY'S REPORT

of

MEMBERSHIP AS OF SEPTEMBER 15, 1953

Active Membership as of September 15, 1952			455
New Active Members since September 15, 1952			77
			532
Less—Reported deceased	6		
Resigned account retirement, etc.	4		
Transferred to Life Membership	4		
Elected to Honorary Membership	2		
Dropped account did not pay dues	45		61
Total Active Members, September 15, 1953			471
Associate Members as of September 15, 1952			101
New Associate Members since September 15, 1952			7
			108
Less—Resigned	7		
Dropped account did not pay dues	6		13
Total Associate Members, September 15, 1953			95
Life Members as of September 15, 1952			72
Transferred from Active Membership (Retired and paid dues for 20 years)			4
			76
Less—Reported deceased			3
			73
Total Life Members, September 15, 1953			73
Honorary Members as of September 15, 1952			5
Elected to Honorary Membership			2
			7
Total Honorary Members, September 15, 1953			7
Total Membership (All Classes)			646

TREASURER'S REPORT

SEPTEMBER 1, 1952 TO AUGUST 31, 1953

Cash Balance—September 1, 1952		$2,917.08
RECEIPTS:		
Dues	$2,630.50	
Advertising (1951 Proceedings)	2,515.00	
Miscellaneous	71.25	5,216.75
Total		$8,133.83
DISBURSEMENTS:		
Salaries	$1,094.52	
Social Security and Withholding Taxes	236.16	
Stationery and Printing (Including 1952 Proceedings)	2,314.27	
Office Supplies	76.46	
New Office Equipment	51.63	
Postage	75.00	
Rent and Phone	317.01	
Convention Expense for 1952	470.54	
Miscellaneous	78.06	4,713.65
Cash on hand, August 31, 1953		$3,420.18
ACCOUNTS RECEIVABLE:		
Due from Advertisers in 1952 Proceedings as of August 31, 1953		1,625.00
Total as of August 31, 1953		$5,045.18

L. C. WINKELHAUS,
Treasurer

APPROVED:
W. H. HUFFMAN,
Auditing Committee

RESOLUTIONS COMMITTEE:

The American Railway Bridge & Building Association in convention assembled, recognizing that the special efforts of certain parties should be fittingly acknowledged, does hereby recommend the following resolutions, to wit:

Be it resolved that the appreciation of the officers, members and guests of this Association be expressed to the management and personnel of the Conrad Hilton Hotel for the co-operation and hospitality we have enjoyed.

Be it further resolved that the sincere thanks of the officers and members of this Association be extended to the Simmons-Boardman Publishing Corporation and its representatives. Their assistance and interest have been invaluable.

Be it further resolved that the sincere appreciation and thanks of the officers, members and guests of this Association be extended to the officers and members of the Bridge and Building Supply Men's Association and to the Track Supply Association. Their untiring and devoted support of our Association at the convention and throughout the year is a vital factor in the success of our efforts. The banquet and entertainment is a bright spot in the year.

Be it further resolved that the sincere appreciation and thanks of this Association be extended to Mr. R. G. May, Vice-President, Operations and Maintenance Department, Association of American Railroads; to Mr. H. J. McKenzie, President, St. Louis Southwestern Railway; and to Mr. C. H. Sandberg, Assistant Bridge Engineer, Santa Fe Railway System.

Be it further resolved that the appreciation and thanks of the officers, members and guests of this Association be extended to Mr.

W. G. Burres and Mr. C. L. Garrett, Structural and Railway Bureau, Portland Cement Association, for their efforts in our behalf.

Your Resolutions Committee recommends that these resolves be spread upon the Minutes of the Convention so that they become a part of our Annual Proceedings and that copies of these resolves be forwarded to the parties concerned.

W. H. Huffman, *Chairman*
G. E. Martin
R. E. Dove, *Resolutions Committee*

REPORT OF AUDITING COMMITTEE

TO THE PRESIDENT AND MEMBERS OF THE AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION:

We, the undersigned members of the Auditing Committee, have examined the books of the Secretary for the period September 1, 1952 to August 31, 1953, inclusive, and have found them to be correct as of the latter date.

Respectfully submitted,
T. H. Strate, *Chairman*
A. E. Bechtelheimer
W. H. Huffman, *Auditing Committee*

Abstracts of the addresses by Messrs. McKenzie and May, as delivered before the joint opening session, are presented below.

Responsibilities of the Supervisor

One of the principal speakers at the joint opening session was H. J. McKenzie, president of the Cotton Belt who spoke on "What Management Expects of the Supervisor and Vice Versa." Mr. McKenzie explained how difficult it would be to draw a line that would separate management from the supervisor, for actually the supervisor's responsibilities are the same as those of higher management, only his are on a smaller scale. "He must see that the proper man is placed in charge of work coming under his jurisdiction." "One of the most difficult things confronting us today is to select the right man for the job, to maintain a good organization, and to see that each officer, supervisor or foreman performs and functions in his position as is intended," he declared. He then explained that he felt management expects the supervisor "to get the job done" —not just to do it "any old way," but to do it efficiently, safely, economically as well as expeditiously. They also expect him to follow any specific instructions when he is given them and to handle work in accordance with usual standard practice and to the best of his ability when no instructions have been given.

Mr. McKenzie also stated that management expects the supervisor to maintain good human relations with officers, fellow supervisors, subordinates and also patrons of the railroad. "Getting along with people" emphasized Mr. McKenzie, is the most important requirement of a supervisor or officer.

He went on to explain that management also expects their supervisors to be resourceful in getting a job done when allowances for expenditures are low. They expect supervisors to think in terms of mechanization and to get away from the old idea of "let me have another 50 or 100 men to do the job." He is convinced that if we are to meet competition in the transportation field today we must find "ways and means of doing the job on a more permanent basis and at less cost."

Importance of Adequate Supervision

The other principal speaker at the joint opening session was R. G. May, vice-president, Operations and Maintenance Department, Association of American Railroads. Mr. May also spoke on the importance of adequate supervision, but first he quoted figures to bring out the decline in railroad freight and traffic business that has occurred since the war. He did this because he felt that "everyone of us who is connected with the railroads should also be familiar with some of the broader problems of the railroad industry." He then outlined a nine-point program that has been set up to cope with the problems of the industry. Following along this line, Mr. May spoke in part as follows:

"Many of the railroads have subscribed to supervisors-training programs, management-training programs carried out by universities throughout the country, seminars of supervisors conducted by officers of the railroads

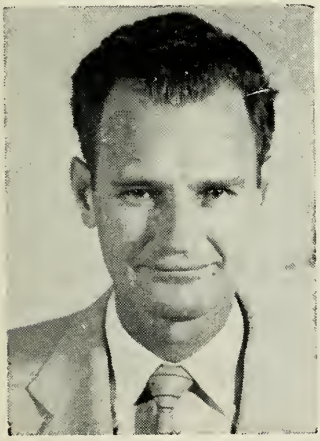
and special courses of instruction." Mr. May went on to say that "benefits derived from such courses cannot be estimated. The specific objectives of any program are: To establish a clear picture of duties and responsibilities of supervisors; to develop both good public relations outside the company and consider human relations problems within ranks; to use the thinking and experience of all; to determine action to be taken; to provide opportunity for getting group recommendations; and to keep supervision informed of better methods."

"Such programs, however, are long-range in nature and are good insurance that the railroad industry will hold its rightful place in a competitive market for service and talent," concluded Mr. May.

Application of Modern Machines and Power Tools to Bridge Maintenance

Report of Committee

COMMITTEE—J. M. LOWRY, *Chairman,* asst. ch. engr., StLSW, Tyler, Tex.; M. J. HUBBARD, *Vice-Chairman,* gen. supt. b.& b., C&O, Richmond, Va.; NORMAN CAREY, *Vice-Chairman,* b.& b., supt., Sou., Washington, D. C.; S. J. BARRANCO, asst. supt. struct., PRR, Pittsburgh, Pa.; J. H. BURKEL, drafts., MP, St. Louis, Mo.; F. W. CREEDLE, asst. engr. maint., C&NW, Chicago; L. M. HARTLEY, mast. carp., SAL, Tampa, Fla.; J. T. HINER, supt. b.& b., Sou., Greenville, S.C.; W. F. HUFFMAN, asst. to ch. engr. C&NW, Chicago; F. W. HUTCHESON, supt. b.&b., C&O, Newport News, Va.; V. W. HUTCHINGS, supt. b.& b., SP, Bakersfield, Cal.; PAUL KNAPP, mast. carp., Erie, Jersey City, N.J.; E. A. MANN, pres., Champion Transportation Sales Chicago; J. H. SAWYER, JR., asst. ch. engr., CGW, Oelwein, Iowa; T. M. VON SPRECKEN, asst. to ch. engr., Sou., Washington, D.C.; J. R. WEBBER, ch. carp., CMStP&P, Spokane, Wash.; J. E. WOLFE, st. br. insp., MKT, Denison, Tex.



J. M. Lowry
Chairman

Modern machines and power tools have made possible the economical performance of bridge maintenance. Power tools and machines have speeded up such work as sawing timbers, drilling holes, bolt tightening, moving and handling materials to the extent that a gang of 10 men can do the work of a 15-man gang not equipped with these tools.

For the purposes of this report the subject will be subdivided into two principal parts: (1) Modern machines, under which will be discussed pile drivers, cranes and trucks; and (2) power tools, under which will be discussed sources of power and tools and their uses.

MODERN MACHINES

Pile Drivers

Many railroads using steam-driven pile drivers and hammers are faced with a water shortage at intermediate points due to dieselization. The problem of supplying water to these machines is one of major importance since water tanks, except at division points, have been retired to a great extent.

The answer in some cases has been the use of water cars in a shuttle service between the job and the remaining water tanks. This shuttle service is, in many cases, not very dependable and is expensive. The water required for pile driving can be greatly reduced by the use of flash boilers and diesel-propelled equipment. At least one railroad has designed and built a self-contained mobile steam power plant which is used to supply steam for the propulsion and operation of pile drivers and can be used for heating special trains parked in out-of-the-way places and other purposes.

A brief description of this pile-driving equipment will be of interest to those railroads faced with hauling water long distances. An old steam engine tender was

used; the forward end housing the power plant. Doors were cut on each side and an automatic flash-boiler-type steam generator was installed, which is capable of producing 1,000 to 3,500 lb. of steam per hour at 75 to 300 p.s.i., enough to operate large, double-acting pile drivers. Two fuel tanks with a combined capacity of 2,160 gal. were installed and an 11,000-gal. water supply tank was provided.

A 10-hp. two-stage air compressor was mounted near the rear wall and a 25-kw. diesel-electric generator was installed beneath the tender to supply 220/440 volts a.c. current for 5-hp. electric motor on the steam generator and the motor which drives the air compressor.

To provide a smooth supply of steam for the pile driver, two steam accumulators were installed on top of the tender. These tanks are equipped with steam traps to return the condensate to the water tank. A full head of steam can be obtained in less than 5 min., compared to from one to two hours required with the old boilers. This car carries water and fuel to operate a pile driver for 10 days.

A self-contained diesel pile driver hammer has been developed which can be used with a crane or regular driver. The hammer is essentially a single-cylinder engine. It is started by lifting the piston or ram and dropping it. At a point in the ram's downward travel a cam-roller-operated fuel pump injects fuel into the combustion chamber between the ram and the anvil. Continued downward movement of the ram compresses the fuel mixture to combustion heat. The resulting impact and explosion drives the pile downward and forces the ram up.

These hammers are made in three sizes, developing from 3,000 ft.-lb. per blow to 16,000 ft.-lb. per blow and the weight variation is from 3,000 lb. to 11,500 lb. The diesel pile driver hammer has not been widely used to date and the committee was unable to gather sufficient data on its operation to make a recommendation for its use. One railroad has used a 3,000-ft.-lb. diesel pile hammer for several months in roadbed stabilization work and its operation has been satisfactory.

Cranes

The use of power cranes in steel bridge work is essential where heavy members are handled. While not absolutely necessary in the maintenance of timber trestles, they are, in a great many instances, time and labor savers. In the renewal of trestles on one railroad, a 10-man bridge gang equipped with a 5-ton crane placed the caps, stringers and deck on a trestle twice as fast as another gang of the same size equipped with the same tools minus the crane. This machine is invaluable in unloading and distributing materials.

Off-track cranes are being used to a greater extent than ever before. Where the footing is stable, they have the advantage of greater maneuverability, are safer from collision with trains and the expense of a train crew is eliminated on many roads.

On smaller jobs and where a power crane is not available, a hand-operated crane mounted on a push car is useful. Where air is available, air motors can be installed on these small cranes to operate the boom. The air motor is small and light and the crane, handling up to 4,000 lb., can be operated by one man. In addition to handling bridge timbers, it can be used to pull a slip scraper for back-filling.

Trucks

Trucks have been used in bridge work for many years but the scope of their use has widened recently—from the small pickup truck used to carry light tools and materials quickly to the job to the heavy trucks equipped with winches.

A truck equipped with a winch can be used to unload and distribute materials, remove and replace caps on bents, lift stringers into place and pass a bundle of ties to the deck. A bridge gang, once accustomed to its use, will not easily part with it.

Another fairly recent use of the truck is in transporting bridgemen to and from the job on highways. Terminal gangs are formed and are assigned territories within a radius of 40 to 70 miles from headquarters. Bridge materials are distributed from a work train and a small motor car is carried in the truck for use when the truck cannot get all the way to the bridge.

The advantages of this arrangement are that it reduces the hazards of collision of a motor car with trains, eliminates the necessity of waiting in sidings for trains due or occupying the track, particularly in yards; cuts out the cost of maintaining outfit and commissary cars; assures the bridgeman that he will be home almost every night, which attracts and keeps a better class of employees.

One disadvantage is that it takes the bridge gangs off of the track, resulting in less frequent visual inspection of bridges and track. Also, while on cars, the gangs

could be moved in an emergency to any location on the railroad and have a place to eat and sleep when they arrive, whereas when traveling by truck room and board must be provided in emergency cases. While working on the outer edge of the territory, considerable time is required driving to and from work. In some cases an arrangement has been reached with the men to travel one way on their own time, offsetting this disadvantage.

POWER TOOLS

Sources of Power

The prime source of power for bridge tools is the gasoline engine which drives an air compressor to supply air or a generator to supply electrical power. There is a difference of opinion on whether the electric or the air tools are best for a bridge gang. In the use of both air and electric tools, it is of prime importance that the power supply be adequate.

Tools and Their Uses

It will not be possible in this brief report to discuss all of the tools a bridge gang uses. Since you are familiar with most of these tools, which have been in use for many years, we will attempt only to discuss new tools and recent developments in old ones.

The pneumatic spike driver is a tool which is rapidly gaining favor in trestle work It can be used for driving light fastenings in the deck and has been successfully used to drive long drift bolts. By hand setting the spikes or bolts and driving with this machine, much time and labor can be saved.

The air hoist is another tool which has great utility in a bridge gang. Due to its weight and size, it is easily moved and can be used in restricted places for handling lighter bridge members where a crane cannot operate. It can be used very satisfactorily in setting and holding piles in line for driving with swinging leads in steel bridges where restricted clearances would not permit operating a pile driver with fixed leads. The air hoist is also used for light driving with a drop hammer.

Chain saws, both electric and air, are generally used in trestle maintenance for pile cutoffs, cutting timbers to length, and removing old trestles. In pile cutoffs the edges of the chain must be kept sharp and experienced operators used if good cutoffs are obtained.

The power reciprocating saws are a new addition to the bridgeman's tools. There is on the market a small, light, pneumatic precision one-man saw with two adjacent blades which move alternately in opposite directions. The exhaust air is so directed that the sawdust is blown from the cut. This saw is being used successfully for pile cutoffs and other precision timber sawing. There is not the tendency to "run-off" the straight edge or saw line in this saw that is encountered in the chain saws, and since one man can operate it where two are required with the chain saws, some labor saving results.

A variation of the conventional type drills for boring steel is the right-angle drill. The bit is at right angles to the motor and its special application is in restricted places where the conventional drill cannot be used.

The jack is an old tool but it has only been in recent years that power has been attached to it. The hand-operated hydraulic jacks are a considerable improvement over the old ratchet or screw type in heavy work.

In heavy steel bridge work, jacks of 100 tons or more are used, which are hydraulically or air powered. Several of these can be connected into the same line and a steel span raised at all points simultaneously by the mere turning of a valve.

Another new tool finding favor with the bridgeman is the device which shoots fastenings into concrete or masonry piers or walls. Whereas before holes had to be drilled and the fastening set in and grouted by hand, this tool, by the use of a cartridge filled with gunpowder, shoots the fastening from the forward end into the masonry or concrete. A safety feature of this tool is that the trigger cannot be pulled until the forward end is set against a solid surface and almost at right angles to it.

Tools for cleaning and painting steel bridges have kept pace with times and, since this work is a considerable portion of bridge maintenance, they will be briefly discussed.

Cleaning steel by sandblasting is still a favorite with many bridgemen. Sandblast machines operating on from 60 c.f.m. to 350 c.f.m. are used. The sand may be either wet or dry. If the dry sandblast method is used, the sand should be clear, sharp and dry. Where local sand meets the first two requirements, it can be dried economically on the job by the use of a homemade drier.

This machine consists of a steel drum 20 to 24 in. in diameter with baffles installed and mounted on supports at a slight angle. An air motor furnishes the power to turn the drum, being connected to it by a chain or belt. A flame made by kerosene or oil

is blown into the lower end of the drum by air for drying the sand being fed into the upper end. A screen is placed on an incline at the outlet end to screen out the particles too large for use in the sandblast machine. An adequate supply of sand can be secured from this drier.

Flame-cleaning equipment has come into wide use in cleaning steel structures for painting. This equipment burns oxygen and acetylene to produce a medium hot flame for searing the old paint and removing scale which can then be brushed off. Tips of several sizes and widths are available. Flame cleaning can best be used during cool weather, the temperature differential is greater and moisture present in the scale assists in the removal.

A considerable improvement has been made in paint-spray equipment. Heavy viscous asphalt materials can now be successfully sprayed by means of a high-pressure air-operated pump. This equipment consists of an air compressor, an air hose between the compressor and the pump which is placed on the open top of a shipping drum, a length of air hose and a heavy-duty material hose between the pump and the spray gun. Spraying heavy materials requires at least 35 c.f.m. at 100 p.s.i. pressure, and for the heavier jobs 60 c.f.m. at 100 p.s.i. pressure is needed.

This equipment can also be used to spray the asphalt-base bonding materials on timber decks, which are then covered with gravel.

In conclusion, your committee wishes to remind you that the only way that bridges can be maintained safely by the limited manpower available and in view of the current number of work-hours per week is through the extensive use of machines and powered tools. It is this equipment that raises the output per man-hour. Just as the old pile-driving rig with the drop hammer has given way to the rig with the double-acting steam hammer, which drives more piles in a specified time, the old coal-fired boiler is now being displaced by the automatic flash - type steam generator which provides an almost instantaneous steam supply. A driver so equipped, like the recently marketed self-contained diesel pile driver, can be used by roads that are fully dieselized in operation.

Your committee recommends the use of this equipment as well as the off-track cranes and derrick push cars. It also recommends that those railroads not already employing trucks for transporting men from a central point to the job, as well as for distributing materials, should investigate the economies of these practices and of the time-saving equipment that can be mounted on these vehicles.

It is the committee's opinion that both electric and air tools have a definite place in bridge maintenance. Air tools are preferred for the steel bridge gangs and the large gangs working on timber trestles, and electric tools are more economical for smaller gangs.

Discussion

Two questions were asked by J. J. Healy (B&M): One, if anyone had had experience with using a 600-cfm compressor for operating an air hammer on a pile-driving rig; and what was being done to place heat on trucks when transporting men? The first question was answered by M. J. Hubbard (C&O) who stated that he is using an I-R type 600-cfm compressor for driving a Vulcan No. 1 hammer. He has two outfits, he said, one on skids and the other on pneumatic wheels, both of which are performing satisfactorily. The second question was answered by R. R. Gunderson (SOU) who stated that the larger type of automatic heater might be used on trucks. H. M. Harlow (C&O) added that he had installed some bus-type hot-air heaters on these trucks.

F. D. Day (PRR) inquired if anyone present had had any actual experience with the cartridge-type stud drivers and what corrosion effect they had on the steel fastenings. P. E. Scites (C&O) announced that he had used this type of driver and had noticed no rust effects. Another member asked if this type of driver might be dangerous, and Mr. Scites replied that they were safe but noisy and sometimes spalled the concrete. Chairman Lowry stated that the nozzle of this gun must be placed almost at right angles to the concrete before it would fire.

G. L. Brown (MP) questioned the use of trucks as far as 70 miles from headquarters as he believed this would be uneconomical. S. White (SP) asserted that his road used trucks extensively and that a schedule had been worked up for their economical use. For regular work, a radius of 30 miles is adhered to. For occasional work, 50 to 70 miles is considered adequate, while for emergency work 80 miles is permitted.

H. O. Adkins (D&RGW) stated that it was the practice on his road to limit trucks to 20 mile distances. He also reported that his road was installing gasoline engines on derrick push cars to make them selfpropelled.

Selection and Training of Bridge and Building and Water Service Personnel

Report of Committee

COMMITTEE—J. M. W. NORRIS, *Chairman,* supv. b.& b., D&H, Oneonta, New York; G. S. CRITES, *Vice-Chairman,* div. engr. (ret.), B&O, Baltimore, Md.; T. E. JACKSON, *Vice-Chairman,* gen. supv. b.& b., SP, San Francisco, Cal.; W. H. BEGEMAN, supv. b.& b., MP, Jefferson City, Mo.; E. ESTER, asst. supv. b.& b., CCC&StL, Indianapolis, Ind.; R. L. FOX, div. engr., Sou., Alexandria, Va.; L. D. GARIS, gen, br. insp., C&NW, Chicago; J. E. HECK, supv. b.& b., C&O, Ashland,Ky.; H. A. MATTHEWS, gen. for. b.& b.& w.s., StL-SF, Amory, Miss.; A. PFEIFFER, asst. supv. b.& b., SP, Oakland Pier, Cal.; W. L. SHORT, br. insp., MP, St. Louis, Mo.; L. C. SMITH, div. engr., (ret.), C&NW, Eagle Grove, Iowa; J. P. WOODWARD, asst. supt. struct., PRR, Pittsburgh, Pa.; S. WHITE, gen. b.& b. supv., SP, San Francisco, Cal.

J. M. W. NORRIS
Chairman

The available manpower of the country from which we must draw our forces is that part of the able-bodied group outside the armed forces which may be attracted by what bridge and building and water service work has to offer. This varies tremendously from the secure home job of a mechanic on a small division where his pay, steady work and retirement plan compares favorably with that of mechanics in the surrounding neighborhood to the "hobo" existence of the floating boarding-car gangs. In addition to the inconvenience of staying away from home they have the additional expense of maintaining themselves away from their families. Their pay compares unfavorably with the outside building trades rates.

The bridge and building and water service departments are much in need of men with building trade training who possess leadership and willingness to assume responsibility to carry out assigned work safely and profitably to their company.

In the past we selected our foremen from men in the gang who showed leadership and had the qualifications, along with willingness to assume responsibility. Today the bridge and building and water service departments find it hard to get men. Those who seek employment are seldom qualified, or have the willingness to assume responsibility.

The older men in the gang who have the experience and knowledge to perform the required work, frequently refuse to assume the responsibility of foreman. The experience and useful knowledge of these older men when not put to use is a grievous loss. Even if unwilling to be foremen they are usually happy to pass such information on. We should do all in our power to assist this process.

The selection and hiring of every new employee, whether it be for a temporary or permanent position, is a matter of great importance. It should be assumed that the man hired may remain with the company for a lifetime. As thorough study as possible should be made to select the right type of men to fill vacancies, because this is the fundamental basis for improving the character, ability and efficiency of the personnel. The "hire and fire" method of selecting employees should be avoided. The realization of the cost of breaking in a new man, and the fact that methods have been developed whereby qualifications of a man for certain lines of work can be tested, indicate that a more studied approach to the personnel problem should be considered. Industry is developing methods we should consider.

Interview Is First Step

An interview is the first step in process of selecting a new employee. The interviewer's work requires tact and shrewd judgment. He should draw out the applicant and obtain information that has any bearing on the latter's suitability for the vacancy. The

worker's output and attitudes are affected by his interest in his job as well as by his capacity to handle it. Determining his interest is a personal matter that depends on the interviewer's ability to gain his confidence. The interviewer should be a good judge of human nature. He should be familiar with job conditions, and, at least in a general way, with the requirements of the job. He should be able to see the worker's point of view as well as the management's to avoid over-selling the job to the applicant. For an interviewer to overstate the conditions of work in order to recruit additional personnel causes dissatisfaction later.

The interview should be conducted privately. Sufficient time should be allowed so that all the angles of each case can be considered fairly and accurately. Although many tests for selection have been developed and offer a real basis for the scientific selection of applicants, most personnel executives regard the work of interviewing as the principal process in selection.

If the interviewer believes the applicant suited for the job he should be sent to the foreman or department head for whom he will work. The practice of employment officials of engaging new employees without previously consulting the men under whom they will work is generally unsatisfactory. Sending the applicant to the foreman tends to strengthen the position of the foreman or department head, and therefore gains his support and cooperation. Such a person is more familiar with the technique of the job, and his opinion of the applicant is correspondingly valuable. No one can be held responsible for results from an organization whose personnel has been selected by others.

If the foreman or department head is satisfied with the applicant, he should give him a clear picture of what the job entails. In case of derailments, floods or failures, he would be required to work long hours in all kinds of weather. He would have to stay away from home much of the time. If he is an extra man, he should be told that he is only holding a temporary position. He should not be promised permanent work or rapid promotion or anything that is not entirely justified. The foreman should notify the employing official that the applicant is satisfactory; otherwise the employment procedure stops at this point.

If the applicant's interview with the foreman or department head is successful, the next step is usually a physical examination. Some men who may be otherwise suitable for the job are found to be physically unfit by the doctor. The physical examination is of benefit to both employer and employee. It protects the new employee against the aggravation of any disabilities he may have. It may bring new ones to light, in which case he will be advised to consult his own physician. This may save him from serious trouble later. Labor turnover and compensation claims may be avoided or reduced.

Inducting the New Employee

The new employee is now ready for induction into the organization. The manner in which this is handled may greatly affect his subsequent attitude toward the company. The new employee usually knows none of the men with whom he is to work, has little knowledge of the company or its methods. He may miss his former familiar surroundings and be hypercritical of the conditions of his new job. Under such conditions, he can hardly be expected to have more than a minimum of interest in his work. He becomes dissatisfied easily and may quit before he has had time to become accustomed to his new environment. An honest attempt should be made to make a new employee's first impressions with his job and the company favorable. He should be made to feel that he is considered as an individual instead of being regarded merely as a productive unit in a large organization.

He should be given a definite statement of just what his wages are to be, and how and when he will be paid. If he is entering a class of work covered by a printed schedule or agreement between the company and the employees, he should be furnished a copy of the agreement. The new employee should be advised as to the duties and responsibilities of his new job, his working hours, to whom he reports and from whom he is to take orders. He should be given a Safety Rule book and instructed that safety is the first duty of all employees. Discipline is an important word on the railroad. He must know and comply with the rules and requirements. He should be given a brief explanation of the disciplinary method in force and the importance of maintaining a good record.

All of the constructive effort of selection and hiring may be wasted by turning the new employee over to some incompetent workman for breaking in. Many times the employee to whom the new man is turned over may not have the right attitude toward his work, or his foreman or company. The

new man's mind may be poisoned the first day of such a contact. If the teacher is not competent or careful himself, a supervisor cannot expect the new employee to become either loyal, efficient or safe. The result of his first few days or weeks of training in his new position may influence his attitude for years.

Must Teach Safe Methods

In addition to specific instruction as to work details each foreman, when holding safety meetings with his crew, should show new men safety hazards and accidents involving injuries, methods to be used to prevent similar accidents and to eliminate hazards should be explained. Maintenance of way rules are discussed at these meetings and new employees should be required to become familiar with them. Special attention should be given at these meetings to operating train schedules and the methods required by existing rules to protect train movements and track motor car operation.

When supervisor and the general foreman give talks to their men on methods to be used in carrying out their work and the necessary mechanics connected with such work, the encouragement of all crew members to ask questions about their duties and to give constructive suggestions relative to the work results in the development of the more interested crew members for training for further advancement.

Crew members, both new and older, who show interest in their work should be given attention by the foreman, supervisors and division engineer's staff in the way of personal contact, instructions, instructive literature and assignments of some responsibility. Whenever possible, where some special contract work is going on, such men should be offered an opportunity to learn new methods of doing work and pick up some of the skill of contract carpenters, masons, bricklayers and painters. The danger in this method is that once in a while the men are attracted by the higher wages paid by the contractors and consequently leave railroad service.

Training is really a specialized application of the functions of direction and supervision. Both of these functions invoke personal contacts between the subordinate and his superior that result in some increase in the subordinate's skill or knowledge. Consequently, training tends to take place on the job. It is some times possible and advantageous to centralize preliminary training, but the training of any employee necessarily is the responsibility of his superior.

The foreman has a key position in the training program of any industry. He frequently has to interpret the company's policy to individual employees, interpret the worker's interests to the management. He must adjust individual grievances satisfactorily, whenever possible. He gives a face-to-face leadership to the men under his direction, and in consequence necessarily influences their attitudes. The amount and quality of the work turned out is in part a result of his skill in coordinating their activities. The foreman's job is fundamentally one of leadership. Management in general has come to realize this, and in consequence foreman-training courses are to be found in many industries.

As for the training of bridge and building personnel, let us face facts. Formerly, when we had more capable and experienced men working in our gangs, it was possible for new men to acquire training from the more experienced men. The foreman could give more personal attention to the training of the new employee. Now in many instances, especially in floating or outfit gangs, there are few, if any capable experienced men from whom new employees may learn. Due to the lack of capable or experienced men, the foreman has little time to give personal training to the new employee.

Discussion

H. G. Lehman (SP) began the discussion by stating that he believed that the report was inconsistent in that, at the beginning, it says that the foremen should train the men, then later states that the foremen do not have enough time and that the older men should train younger employees. G. E. Martin (IC) answered this objection by saying that both should do so—the foremen when they have the time and the older men helping at other times.

J. J. Healy (B&M) pointed to a statement in the report where it states that the pay of railroad b. & b. men does not compare favorably with those men doing comparable work in industrial trades. He wanted to know how it would be possible to attract such men to railroad employment as the report suggested. He said he was of the opinion that it was more probable that the railroads would have to rely upon the employment of younger men who, if they made satisfactory progress within 60 days, could be regularly employed. But, he said, if they did not show promise within that period, they should be dismissed.

Mr. Lehman pointed out that every job

in the b.& b. department must be bulletined and new men could not be given carpenters' rates. S. White (SP) stated that this is a question with which all railroads are faced today. He believed that the older, experienced men were getting fewer as time went on owing to their age and retirements.

In response to Mr. Healy's question, L. Mayfield (MP) said that he had been able to hire men from outside industry because the men had regular employment, whereas, they were employed intermittently by contractors. Also, because of their skill, they were not helpers very long and were promoted.

E. H. Barnhart (B&O) stated that labor agreements varied on the different railroads, some having a 60-day trial period and others 90 days. He added that the foremen were the ones who decided which men would be promoted. H. M. Harlow (C&O) stated that it was the practice on his road for the men to be hired through the employment personnel office, but the foremen were encouraged to recommend men to the personnel office.

Programming Repairs and Replacements

Report of Committee

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J. J. Healy
Chairman

In presenting this report to the convention, the committee is aware of the fact that the membership consists of supervisory officers of Short Line railroads and Class II railroads as well as Class I systems which serve several states of the country. We realize that, although the problems confronting the supervisor may vary on different classes of railroads, the fundamentals for programming work schedules are essentially the same and we hope the report may be of benefit to all present.

The word "program" may be briefly defined as "a course of action prepared or announced beforehand." However, before a bridge and building supervisor can publish or announce a work program for a year or any part thereof, there are many steps of preparation which the committee will present for your consideration. It is logical to consider first the programming of repairs and replacements of bridges.

Bridges

Immediately at the close of the winter season, the bridge inspector and his assistant should begin the field inspection of track bridges, overhead bridges, and industrial trestles so that all of these structures may be thoroughly examined. The inspection should be completed in time to allow the supervisor enough time to make an inspection of questionable structures and prepare a repair program by the designated date.

The extent of the inspection of any structure should be the joint responsibility of the supervisor and the bridge inspector. It

is recommended that both should review the past history and check against previous reports of a structure, which may furnish information on recurring trouble spots in the bridge.

A large number of railroads are maintaining structures, particularly overhead highway bridges, which are subjected to far heavier loads than those for which they were originally designed. In these structures, damaged stringers or floorbeams viewed from below may be overlooked or inadvertently classed as timber checking unless inspected from a ladder or staging.

Making Inspection Reports

Inspection reports should be made out on a standard form and a sketch attached detailing any defect or condition not readily explained in the items contained on the standard form. While the inspector is on the road these reports should be forwarded to the supervisor currently. This will enable the supervisor to observe the progress of the inspections and also to review the reports to determine if all pertinent information is contained therein, before the inspector has traveled too great a distance for a recheck if one is required on a questionable bridge.

When reviewing these reports the supervisor should check each item on the report and mark up his copy, noting any structure requiring special attention when he makes his personal annual inspection with the division engineer or other superior officer.

The annual inspection by the supervisor should be made as soon as possible after the bridge inspector has finished and he should be accompanied by designated officers. This will permit a joint inspection and a definite understanding on work which may be deferred and ensure the preliminary approval of items to be included in the program for the succeeding year.

If a good inspection has been made by the bridge inspector and the reports have been prepared in an intelligible manner, the supervisor's inspection can be mainly a superficial check except on structures where there are questionable items. In such instances the supervisor's inspection must be thorough and extensive to allow no doubt as to the condition of the structure. When the field inspection is completed, the supervisor is then ready to make up estimates for the projects to be included in the program.

At this point, we would call attention to the preferential handling of items of work on highway bridges or other structures in which town, city, county, or state authorities are involved so that negotiations for allocation of expense or legal proceedings for alterations may be initiated and concluded without too much delay.

In preparing the estimated costs of the items to be included in the program, the supervisor should consult with the purchasing department on the availability of materials and the anticipated price trend of the materials required.

The estimates having been prepared, the program may now be set up in form for approval by the division engineer. At this stage it is recommended that the supervisor and division engineer confer and agree on all phases of the program particularly the priority of the various items in the program, the availability and use of equipment which is used alternately by the track and B&B departments and anticipated manpower requirements to execute the program efficiently.

In the meantime, a list of timber requirements for the program and the approximate delivery dates required should be forwarded to the tie and timber agent or the stores department in order that the receipt of the material will coincide with the assignment of crews and scheduled use of equipment previously lined up with the division engineer and supervisor of work equipment.

Avoid Tight Schedule

The scheduling of commencement and completion dates for each project in the program and the accomplishment of the work according to the schedule is the goal of every supervisor. However, from practical experience we know that this ideal is seldom achieved due to unforeseen emergencies, authorization of capital projects requiring the use of maintenance forces, reduction in manpower on account of decreased revenues and the late delivery of materials.

In view of the possibility of interference with the maintenance program, the supervisor should not set up a tight schedule of work but rather should allow some elasticity so that the entire program will not be thrown out of gear.

Most railroads have set up a regular maintenance labor allotment which fluctuates only between summer and winter forces based on the requirements of the past several years and the supervisor must be governed accordingly when planning his work.

Some railroads permit the division officers to obtain additional forces to carry out A.F.E. projects without interference to the mainte-

nance program. On railroads where the A.F.E. projects are not extensive and approvals of capital expenditures are intermittent it may be possible to augment the regular crews by adding an assistant foreman and two or three mechanics to perform the necessary work on A.F.E. projects.

In the event that it is necessary to reduce forces for financial reasons it will be necessary for the supervisor to review and rearrange the program to ensure the accomplishment of the most important projects.

Check with Stores Department

Cooperation with the stores department was mentioned previously in this report and, although this department may apparently make every effort to obtain the material required for the bridge and building program on schedule, it must be remembered that there are demands for materials from every other department of the railroad which may adversely affect the delivery of the bridge and building requirements. The supervisor or his assistant should, therefore, actively follow up the requisitions which have been placed, by checking with the stores department far enough in advance of the scheduled dates of the various program projects.

For an understanding of the difficulties confronting the purchasing and stores department, the supervisor should be reasonably familiar with the procurement, handling, and treating processes of materials.

Some Class I railroads purchase timber in rough sizes and season it at a central point on their lines adjacent to their own or a commercial treating plant. Others may purchase their timber sized and treated at a distant point off line. These conditions must be considered when planning the work. Even with a good working knowledge of the problems of the stores department, delays in shipments may be occasioned by strikes, non-availability of cars due to revenue requirements or just plain shortages of material. Again, due to these circumstances, the supervisor may be obliged to rearrange the program to fit the current conditions.

We have dwelt at some length on the various steps of the program leading to the actual work and should now consider a very important item for effectively accomplishing the work. The supervisor should be familiar with the capabilities of each of his foremen. It is accepted that there is a wide range in personal ability of the foremen in the performance of their required duties, and the supervisor must assist and instruct each foreman in varying degrees so that the work may be performed to the best advantage of the men, material and equipment available.

Upon the completion of each project a report should be submitted by the foreman outlining the repair work and replacements on the structure and this report should be filed for future reference by the supervisor. This information is valuable in determining future repairs and renewals and will provide substantiation of heavy maintenance expense on certain structures which should be redesigned and rebuilt for present and future traffic loads. Also this record will alert the supervisor on trouble spots within his jurisdiction.

Buildings

The buildings on our railroads, particularly the passenger and freight stations, are our silent salesmen and tend to influence public opinion to a large degree. The supervisor responsible for the maintenance of these buildings has little or no worry on the development of structural defects from overloading, but there is the possibility of hidden defects due to deterioration and corrosion, which, if observed in the early stages, will keep the maintenance costs to a minimum.

Other buildings serving the various departments of the railroad, such as repair shops, enginehouses, diesel shops, locker rooms, retarder towers, etc., are subject to daily visual inspection by the occupants and obvious maintenance items are reported to the supervisor currently for correction. These reports, however, do not eliminate the requirement of a periodic inspection of the structural members, paint, roofing and heating plants of the buildings.

The frequency and scope of building inspection is largely dependent on the type of construction, use of the building, and the climatic conditions.

The general procedure previously outlined for preparation of the bridge program should be followed insofar as practicable, with the ultimate decision on repairs or replacement resting with the road's engineer of maintenance of way.

The supervisor should present a detailed report of the condition of the building together with his recommendations and the necessity for program repairs or replacements. These recommendations should be governed by future plans for expansion, pos-

sible retirement of the facility or discontinuance of its use by the department in occupancy.

In preparing the building repair program the supervisor should be familiar with the durability and economics of building materials already in use and should be informed on new materials introduced on the market, which may be used more advantageously or at less cost without sacrificing durability. We strongly advocate a thorough investigation of the claims of any new product before the supervisor recommends its use, other than for test purposes. Time does not permit nor is it the intent of this report to cover the many products used in building construction and maintenance, but we do feel that the supervisor has considerable latitude in this phase of his work and is expected to use his knowledge judiciously for the economical maintenance of the buildings under his supervision.

The two major items noticeable to the traveling public, and upon which the most unfavorable comments are received, are the condition of the building paint and the maintenance of station platforms. Both items should receive special attention in preparing the annual building maintenance program.

In this report, the committee has covered, in a general way, two important annual programs for repairs and replacements. There are other categories or divisions of work which should not be overlooked and which may warrant a formal program depending upon the size of the railroad.

We have reference to the following facilities maintained by the bridge and building departments: Water stations, fueling stations, turntables, snow-melting devices, fuel storage tanks, platform safety lines, etc.

On one eastern railroad, the bridge and building supervisor prepares separate annual programs for repairs and replacements of the following items:

(1) Bridges-repairs and renewals.
(2) Bridge painting.
(3) Building repairs and painting.
(4) Signal painting.
(5) Low-pressure boilers and air tanks.
(6) Highway crossing protection signs.
(7) Turntables.
(8) Track scales.

In conclusion, the committee is of the opinion that the programming of repairs and replacements by the bridge and building supervisor constitutes the most important part of the yearly work and the capabilities of a supervisor may well be judged by his preparation and execution of the annual programmed work in his territory.

Discussion

H. O. Adkins (D&RGW) stated that he found it very difficult to make bridge inspections twice a year and cover all of his structures. Mr. Gladwin (SL-SF) announced that he had the same difficulty until a full-time bridge inspector was assigned to this work. The assigned bridge inspector spent the majority of his time making bridge inspections.

Rejuvenation of Safety Meetings

Report of Committee

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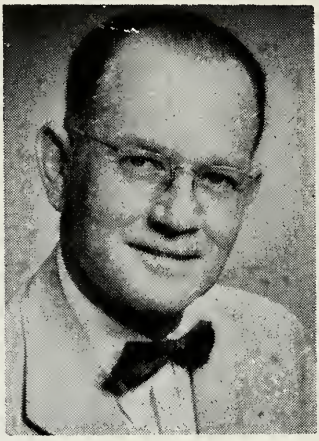

Marshall Jarratt
Chairman

The safest device known is a careful man.

Through education and proper supervision every man can be made a safe worker. Sometimes careful study, close observation of the work, and personal contact are necessary to accomplish this end.

The subject indicates that safety meetings are "old stuff," dull and devoid of interest, and, that they are in need of stimulation, rejuvenation or "a shot in the arm."

Generally speaking, we do not hold with this theory, however some safety meetings are devoid of interest and need something added or taken from them, or at least something different to attract and keep the attention of employees and listeners.

How are we to accomplish this? First, instill into the minds of our employees that accident prevention has a nobility of purpose, that its objective is commendable, that its cause is just, and that its good is not material gain, but conservation of human life and the elimination of suffering. Once we have done this, our course is set and our task is simplified. Each participating member will then feel that he is working not only for his own good, but also for the benefit he might be to his fellow workers. Then accident prevention, like virtue, is its own reward.

We should give *very close attention* to all new employees and brief each one from an accident possibility or frequency standpoint. Insist that he must observe safety rules and convince him they are for his benefit. Tell him frankly that disregard for these rules and for the welfare of his fellow workers and himself, merits dismissal. Convince him that "the best safety device is a careful man."

Stress and insist upon human relations, and bring them up in each meeting. When a personal injury of any magnitude occurs take a personal interest in the injured one and contact his family to see that they do not suffer or worry more than is absolutely necessary. The supervisor must show a personal interest in each of his employees and their families. This may be patronage and it may bring about paternalism, but it gets results. The American people appreciate assistance, but they do not appreciate interference with their personal affairs. They can, in most cases, be led where they cannot be driven.

Make Safety Meetings Attractive

The safety meeting should attract the audience with its own merits. To make a safety meeting attractive, the following items will be definitely beneficial:

(1) Hold small meetings with men of the same trade or craft. These meetings should be presided over by the supervisor, or his assistant in order to be efficient and effective. In small meetings individuals will feel free to express themselves openly.

(2) Choose the most desirable room available for the meeting. This room should be spacious, well lighted and ventilated, with seating arrangement properly set up and ev-

ery effort should be made to see that the audience is comfortable.

(3) Make the men feel the meeting belongs to them by audience participation. Ask for suggestions.

(4) If a particular meeting is to be of the lecture type, then use as many training aids as possible, and, if statistics are used, keep them to a minimum.

(5) Schedule the meetings at a convenient time and place for those expected to attend.

(6) Be certain that the topic is timely.

It is well known that to make safety meetings more effective, more interest must be stimulated in the whole safety movement. It is generally understood that the foundation of safety is education. A safe person is teaching, preaching and acting safety at all times and at all places—at home and on the job—whatever it may be or whenever it is—he or she is thinking and acting safety.

When you have qualified or interested workmen on your railroad you will have rejuvenated safety meetings. We must create more interest in all railroad workers in safety and we must do it with education in safety and what safety means to all of us and to our families.

Stimulate Interest in Safety

We have said that education is the foundation of safety in railroad work, or in all industry. The responsibility rests first with the supervisor for teaching safety to his men. When you get interest stimulated to such an extent that all the employees think and talk safety not only at work but at home, then call a safety meeting and fill the house. Have someone act as chairman who knows how to talk the language your audience understands and see the interest that is shown. When some item is brought up and discussed let them know that it is appreciated and see that the item is followed through and let them know what is finally done about it. Let them understand that the whole safety movement is a joint effort on the part of management and workers to stop injuries and property damage, and that management is going all out with their part of the program.

Each district or division should set up a program for safety work. There should be trips made over the division with staff officers who should stop and visit with each group or gang and talk about safety. Tell them about any safety meeting that might be coming up and invite them to attend. On these trips talk to the men about safety equipment such as goggles and safety shoes and about ways of doing items of work which are considered dangerous. In safety meetings each worker should be asked to report any unsafe condition or unsafe practice he has observed during the past week. Each unsafe condition or practice should be investigated promptly and corrective action taken as soon as consistent.

There have been many approaches to the subject of stimulating more interest in our safety meetings. We must get it across to the workmen that the meetings belong to them and the management wants to go all out to assist them in their safety work. We should also try to stimulate interest among the wives too. They are the silent partners in the railroad business and can be a big help in getting their men interested in safety and attending safety meetings.

Prizes Sometimes Given

Some railroads, to create interest and insure large attendance to safety meetings, have made a practice of giving prizes at each meeting. Holders of lucky numbers are given useful prizes such as groceries, pencils, flashlights and tools. On Christmas and perhaps on one or two other occasions larger prizes such as safety shoes, chickens and hams are given. At these larger meetings both nonreportable and reportable injuries which have occurred during the previous month are reported and discussed. Frequently these reports not only include accidents that have occurred on the local division, but throughout the entire system. The review of these accidents, with proper explanation of methods to avoid them, is educational and indicates how easy it is for some accidents to occur.

Another method used on some railroads to stimulate interest is to appoint or select a different employee each month as the chairman of the safety meeting. He normally is allowed to choose his own subject and is encouraged to prepare himself. He may want to give a short talk or may decide to conduct a conference or discussion on a subject of his own or his supervisor's choice. In general, subjects should be concerned with the immediate experience of the men and may or may not be strictly safety.

Audience Participation

We attach a great deal of importance to participation by all concerned, feeling that if the men can to a large extent, make their

own meetings, they will invariably be interested and will profit in proportion to their interest. On one road this feature has been developed by having semi-annual meetings for the foremen. These meetings are attended by division officers, labor representatives and other supervisory officers available. At the beginning, the local supervisors stress the point that the meeting belongs to the foreman present and that he only intends to state certain pertinent statistics, and review outstanding accidents, after which the meeting is open for a round-table discussion of any points pertaining to their work.

Two-way communication between the employees and management is mentioned as being beneficial and this brings about a much closer relation between them. At times it may be difficult to get anyone to ask questions or start a discussion. This may be overcome by having two or three foremen who are good talkers, lined up to lead off with some point. This encourages others and it will lead up to many items which would otherwise never be mentioned. These meetings usually last about three hours and at the close all are invited to attend a luncheon at the expense of the management. After the luncheon a "meet the supervisors" program is held. At this time all are urged to shoot questions at the division officers, on any subject pertaining to rules, safe working conditions, tools, etc. There is no question so insignificant that it is not given consideration. In rare instances questions may be asked which cannot be answered immediately, due to policy or other reasons, but those in charge should make certain that an answer is obtained and sent to the party involved as soon as it is available.

The employees attending these meetings are told that the management is not merely interested in a safety record but they are interested primarily in the prevention of suffering to the employees and their families. It is felt the benefits derived from meetings of this kind more than justify the wages of the employees in attendance and the cost of the luncheon.

Role of Union Representatives

Leadership and initiative are the prerogatives of management. The non-controversial field of accident prevention can be used to create better relations between management and labor. The fact that local or general chairmen are union representatives, is an indication they have the desire to lead and usually have considerable influence with the men they represent. Management can direct this talent and desire on the part of these union representatives into constructive paths by inviting these men to take an active part in the accident prevention program. The psychological effect that is developed when union representation is closely aiding and abetting management in this common cause, cannot fail to provide more hope for better understanding and economic cooperation by these men. Management stands to gain much when union representation is cooperative.

Interest in the safety program, together with an increase in the quantity and quality of the work, can be developed by increasing the effectiveness of our foremen in leading the men in their gangs. Personal pride and dignity are inexplicable parts of the mental equipment of a successful foreman.

It is an acknowledged fact that the prestige of a foreman with his men is less today than is was twenty years ago. As the job security of the men increased, the foreman's authority and thus his ability to maintain strict discipline was reduced. One of the best methods that can be used to increase the efficiency of labor is to instill in our foremen the knowledge, and personal pride in that knowledge, that they are part of the management team.

Safety and accident prevention can be used to re-create a class consciousness and widen the mental and physical gap that separates the foremen from their men. Thought provocative letters to the foremen on the subject of "supervision," phrased to increase the pride of the foremen as a class, with a strong over-tone of accident prevention practices, are beneficial.

Set the foremen apart from their men at the formal safety meetings by placing them at the speakers table. See that the foremen are individually introduced to the officials and guests at the meeting. It is through the safety movement that management has the opportunity to build up the morale of the foremen, and to tighten discipline with a vigor that would create labor organization resentment and retaliation if it were not used to show labor ostensibly that management was using every means available to create a safe place for the men to work and was regarding the workmen as human beings.

The "Rejuvenation of Safety Meetings" will be accomplished when management, through the various grades of officials, is insistent in its demands that all concerned make a serious and sincere effort to maintain an

effective accident prevention program. Accident prevention planning should be made a part of every project. Safety meetings with the men should be carefully planned. The material presented to the men should be specific, practical and of genuine interest to them. The educational portion of the program, the posters, safety letters, motion pictures, practical talks on specific hazards of the work must be well conceived and based on a knowledge of accident-producing conditions found in maintenance-of-way work. The men must be clearly instructed in methods of doing work safely, and the safety regulations must be enforced. Remember too, that a good foreman is the best safety device on the job. Encourage the men to take an active part in the different phases of the safety program. The accident prevention program belongs to the men. Leadership is management's contribution to the success of the program. The mutual interest of management and labor in safe operations and conserving human lives must be so integrated that labor, as well as management, sees safety is no accident.

Discussion

J. J. Healy (B&M) stated that his road has set up a committee, the membership of which is rotated among the foremen and supervisors, for analyzing accidents. He said he had noted that the foremen exercised unusually good judgment in describing how the accident being analyzed could happen and how it could have been avoided. After each accident is analyzed, he said, the analysis is typed up and sent out to all foremen and supervisors for review and discussion. This method has stimulated interest at the safety meetings because all foremen do not always agree with the findings of the analyzing committee which results in spirited discussions.

W. H. Huffman (C&NW) stated that new machines would make an excellent subject for such committees to investigate as some good advice on how to use the machines safely could be obtained.

J. M. Lucy (D&H) stated that his road promotes interest in safety among the men by having a different foreman preside at each monthly safety meeting and also present a report. In this way, he said, eventually all have a chance to participate personally.

Mr. Lucy also stated that he was having some difficulty in getting his men to use safety goggles. Mr. Huffman said that the same situation was true on his road. W. E. Fuhr (CMSP&P) stated that this reaction was no doubt brought about because the glass of the goggles became fogged. His road, he said, has adopted the spectacle type of goggle which, owing to provision of ample ventilation space, does not fog.

Another member stated that his road also had trouble in getting the men to wear the goggles until a proprietary preparation was issued for coating the lenses which prevents fogging. Mr. Lucy added that he had noticed that the men who normally wear prescription glasses always wear the protective safety glasses.

Ventilation and Air-Conditioning of Railway Buildings

Report of Committee

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W. H. Bunge
Chairman

While air conditioning includes ventilation as one of its fundamentals, it is considered appropriate to confine the subject matter of this report substantially to a discussion of air conditioning as separated from the normal concept of mechanical or natural ventilation.

Air conditioning is no longer in the luxury category. It has been found to be an important function in the present way of living and of conducting business. It is credited with being an economic advance in business and should certainly be given careful thought both in future planning and in maintaining operations in existing facilities.

While climatic conditions vary to such an extent that the usefulness of air conditioning is greater in some areas than in others, installation of air-conditioning systems has been widespread in recent years. In seven large cities over the nation in which there are hundreds of tons of air conditioning, average daily high temperatures (deg. F.) for the months of August and September are as follows:

City	August	September
New York	80.1	74.1
Los Angeles	82.1	80.7
Chicago	79.0	72.7
Atlanta	86.2	82.0
Detroit	79.1	72.8
Dallas	94.1	87.7
Houston	92.5	88.1

Even in October, Houston and Dallas have average daily high temperatures of over 80 deg., an average greater than those for Chicago and Detroit for the month of August. This is also true for many other locations in the Gulf Coast area and in several southern states where the hot weather season holds sway for from six to eight months.

Practically all buildings, except those used for heavy shop work, are subject to being air conditioned. There are many advantages to be derived from air conditioning. An air-conditioning system properly installed will provide fresh, clean air at the correct temperature for human comfort, will establish humidity control, will result in dust elimination and noise reduction, and will effect odor control.

Economical values to be obtained in any single installation may be indefinite. Cost of installation and operation in some instances may be greater than any economies that may be expected. There are some situations, however, such as radio repair shops, diesel injector repair shops, and other similar places, where ventilation is poor and cannot be corrected adequately by mechanical means, air is contaminated with dust, and odors are heavy and unpleasant, and in which air conditioning may be considered a necessity.

In offices where personnel is confined to desk work for the whole work day, business and efficiency surveys have developed that air conditioning will increase production and worker efficiency.

The type of building and the type of system to be installed will greatly affect air-conditioning installation and operating costs. If the building under consideration is of the more ancient architectural type, that is to say, a building with high ceilings, large windows, and no insulation, it will likely be advantageous to lower and insulate the ceiling and reduce the size of exterior openings, or protect them from solar radiation, all of which serves to reduce the heat load.

Computing Heat Load

Should the building be fairly well protected from temperature transmission, then the refrigeration load may be relatively light. In computing heat load, it is necessary to compute and consolidate all surface transmission losses, leakages around openings, solar radiation load, occupancy load, electric lighting load, and machine load. The total heat load thus accumulated is computed in British thermal units and converted into refrigeration tonnage, 12,000 B.t.u. per hour, or 200 B.t.u. per minute, being equal to one ton of refrigeration. Where machines of high heat output, such as blueprint machines, accounting machines in quantity, and some laboratory equipment, are operated, it may prove practicable and likely economical to provide separate ventilation by fans and ducts to discharge heat generated by such equipment directly to the outside atmosphere.

In multi-story buildings, heat load through floors and ceilings becomes neutral when all floor areas are air conditioned. This also applies to walls between air-conditioned areas where temperatures are maintained approximately equal.

In surveying the heat load which may be involved in the air-conditioning of any building, it is of considerable importance for the engineer to be familiar with the solar load on the various exposures at different times of the day. This is of particular importance with respect to glass exposures without any protection.

Humidity, Dust, Odors

In addition to the important function of achieving proper distribution and circulation of conditioned air, the matters of control of humidity, elimination of dust, and odor control are most important. Proper distribution and circulation of conditioned air and control of humidity are functions subject to engineering design. The matters of dust elimination and odor control are mainly matters of mechanical equipment, although they are also subject to design considerations.

Control of humidity is of very nearly as much value as temperature control, being essential for optimum results in providing for human comfort. In practically all instances, it is necessary to take water out of the air stream, that is to say, to reduce the relative humidity. It has been found that provision of refrigerated air with a relative humidity of from 45 per cent to 50 per cent satisfies requirements with respect to overall comfort.

Scientific tests have developed many obnoxious substances to be present in dust-contaminated air. Such substances include small particles of vegetable fibre, parts of hairs, carbon particles, earth, ash and other miscellaneous bits of foreign matter. These substances are irritating to the respiratory system and, under most conditions, are germ-transmitting particles. In an air-conditioning system, dust particles are trapped in filters, thereby providing measurable relief to people suffering from hay fever and other respiratory ailments. It should be noted here that filters must be cleaned periodically or, if of the disposable type, renewed periodically. In most areas, this cleaning or changing of filters should be undertaken at least once each month.

Odor control is a part of air conditioning also productive of human comfort. Control of odor is usually accomplished by introduction of fresh air into the circulating system. There is no known formula for computing the exact amount of fresh air required, the volume varying from 15 per cent to 100 per cent of the total volume of air circulated. For instance, in an area where food is served and where considerable cooking is done, conditions would probably require 100 per cent fresh air to be introduced into the circulating system. On the other hand, in a large office area, occupied by a small number of people and where very little or no smoking is the general practice, the volume of fresh air necessary would be somewhat less; even, perhaps, as little as 20 per cent.

There are some additives available for use in the air stream in the matter of odor control but, to date, results obtained from the use of them are not conclusive.

The type of air-conditioning equipment to be installed in any given situation may be determined by several factors. Primarily among these are the following:

1. Permanency of the structure and type and permanency of the occupancy.

2. Space available for duct work.

3. Space available for self-contained units.

4. Space available for centrally located units.

5. Adequacy and condition of existing heating system if to be retained separately.

6. Desirability of combining cooling and heating systems.

If the structure under consideration is to be newly constructed, then the structural design should provide for what is required.

There is a choice between several different available types of air-conditioning systems to suit various requirements. These types may be briefly stated as (a) the conventional type, (b) the low velocity duct type, (c) the high velocity conduit type, (d) self-contained units, (e) window or console-type room coolers, (f) evaporative-type coolers, and (g) a combination of several systems.

The conventional type of system provides for air to be filtered, humidified or dehumidified, and cooled or heated at a centrally located equipment room, the air thereafter being circulated and distributed to various room areas by overhead ducts and grills.

In the low velocity duct system, the air is filtered, humidified or dehumidified, and fresh air added as required in a centrally located equipment room and thereafter circulated to various room areas by low velocity ducts. The air is cooled or heated to the desired temperature in the central equipment room before being circulated to coil units in the various room areas. This system requires a return air duct and sufficient space for both ducts and water piping.

In considering duct work, it may be well to note here that the sectional area of ducts required for cooling purposes, in practically all cases, will be in excess of requirements for heating purposes; therefore, the sectional will generally be the governing factor. Also it should be noted that where air ducts pass through areas not air conditioned, it is necessary to properly insulate such duct work to eliminate condensation and to reduce loss of temperature.

The high velocity conduit type system consists of a centrally located refrigeration and heating plant from which cold or hot water is piped to cooling or heating coil units in the various room areas. Fresh air is filtered and humidity controlled in a fresh-air conditioner house and is supplied by high velocity conduit to the individual room units. The system requires no return air duct and less structural space in which to install room conditioners, duct and piping, etc.

Self-contained air-conditioning units are available from many suppliers in cabinet form in capacities of from 2 tons to 20 tons of refrigeration. These units do not require excessive room space and usually a minimum amount of duct work is required. It is necessary to provide three-phase electrical service to the units and water must be piped to a cooling tower of adequate size for the number of units installed. Self-contained units provide for an economical installation in smaller areas.

Window or console type room coolers are self contained and can be installed in any window or wall opening. They are adaptable to small or isolated room areas and require no plumbing or water connections. These units are manufactured in ½-hp. ¾-hp. and 1-hp. sizes. For the ¾-hp. and 1-hp. sizes, it is recommended that 220-volt, single-phase electric service be provided. A desirable feature of the room cooler units is that they may be installed with the least amount of physical alteration to the building and may be readily removed from the premises should occasion require.

In semi-arid areas, a type of air cooling is in use where the outside air is pulled through a wet filter and forced into the conditioned area by fans of high capacity. These units, generally known as evaporative coolers, are installed in an exterior wall or roof opening and connected to a water supply. The units add humidity to the air supply and provide cooler air by the process of evaporation.

Combination Systems

Any of the above described types of systems, except perhaps the evaporative coolers, can be installed in combination. Such an arrangement is particularly desirable when certain room areas of the structure to be air conditioned are subjected to around-the-clock service while other portions of the structure are subjected to only one shift service. The most usual combination is made up of a central plant unit for the heavier daily service and self-contained or window or console type room cooler units for the areas retained in service beyond the usual work day.

Determination with respect to installation of air conditioning equipment involves several factors beyond the initial cost of the in-

stallation. Chief among these factors are the matters of how well the proposed installations will fit the requirements, how flexible will be the installation, and what will be the cost of operation and maintenance of the system upon its completion and placement in service.

When plans are being made to install air-conditioning systems the designs should be checked with building authorities to make certain that they conform to local requirements.

Discussion

M. Swanson (DT&I) inquired if 6-in. ducts were used with the high-velocity conduit system mentioned in the report, and whether or not the air passed over separate cold and hot-water coils. Chairman Bunge stated that the 6-in. ducts were used but they were flared out after passing over the coils, which, he said, contained hot water when heating and cold water when cooling is desired.

W. A. Huckstep (MP) told of his work of installing an air-conditioning system in his road's general office building in St. Louis. He also pointed out the difficulty of satisfying everyone with such a system because, even when two persons are sitting side by side, one will complain of being too hot and the other of being too cold. He said that care must be exercised in starting the systems at the proper time of the year and the proper time of the day, because outside air may be quite cold in the morning when warmth is desired.

E. H. Barnhart (B&O) stated that he thought there was a great difference of opinion as to the difference of temperature that the system should be set between outside and inside temperatures. Mr. Huckstep said that the U. S. Public Health Service set this differential at 13 deg. Chairman Bunge said that, from the design standpoint, the differential should be 17 deg. but he called upon E. A. Rapp (York Corporation), who is a member of the American Society of Heating Engineers, for an explanation.

Mr. Rapp stated that the society had proved beyond doubt that 82 deg. is the highest temperature at which a person would be comfortable. However, he said, the differential in degrees between outside and inside temperature is variable. For instance, he said, if the prevailing outside temperature is 100 deg., the differential should be 20 deg.; if outside temperature is 95 deg., a 15-deg. differential should be used. At 85-deg. outside temperature, a differential of from 5 deg. to 9 deg. should be used so that the inside temperature will range somewhere between 76 deg. and 80 deg. In other words, he said, the differential scale is variable, but an effort should be made to maintain an inside temperature between 80 and 85 deg.

J. F. Warrenfells (SAL) asked to what extent the insulating of walls is necessary for air-conditioning systems. This was answered by B. M. Stephens (T&NO) who stated that it is not necessary because additional tonnage can be added to the system at about the same cost as the insulation.

Conversion of Shop Buildings for Diesel Maintenance

Report of Committee

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W. F. Armstrong
Chairman

This report will discuss what has been accomplished on several individual railroads, where roundhouses and various types of shop buildings have been converted into use for diesel maintenance facilities.

The ordinary roundhouse, including turntable, can be converted into use for light maintenance and servicing of diesel switchers, road switchers, single passenger and freight units, and, in some cases, coupled units in locations where turntables and stalls are of sufficient length to accommodate them.

The larger repair shops, of longitudinal and transverse types, are usually readily convertible into diesel shops for servicing, and making light and heavy repairs to diesel units. However, transverse type shops that are serviced by transfer tables often present a problem in providing access tracks so that diesels may enter the building in coupled units without using the transfer table.

This report will describe only a few of the numerous conversions that have been made by the various railroads. Those covered represent several types of buildings most often converted, namely: (1) roundhouses, (2) roundhouses with adjacent machine-shop facilities, (3) longitudinal type repair shops, and (4) transverse type repair shops.

Roundhouse Conversion

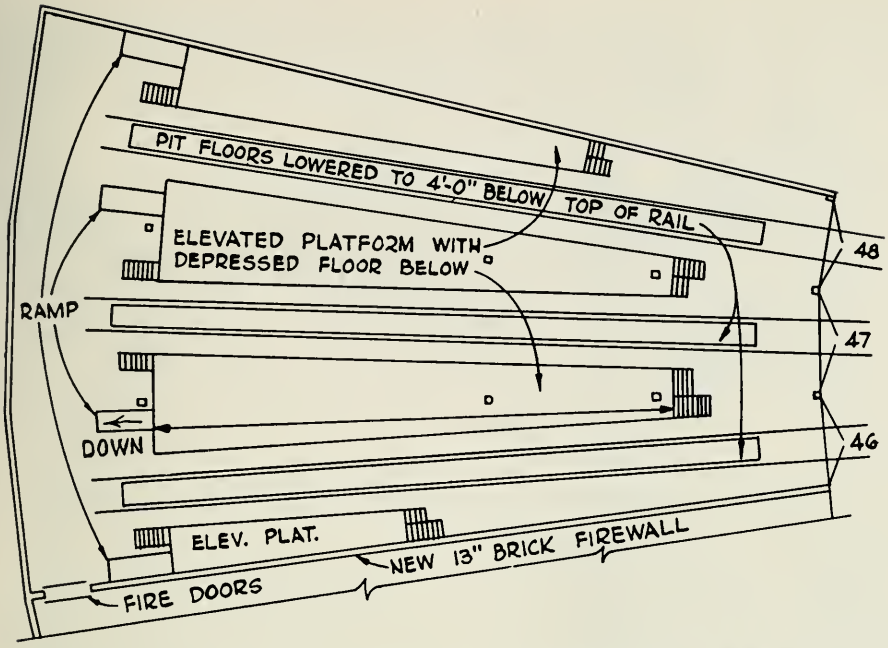
Three stalls of a roundhouse on the Illinois Central were remodeled to provide facilities for servicing and making light repairs on diesel switchers. Six such units can be accommodated at one time, and because of the short length of the units, the turntable is used for access to these stalls.

This roundhouse has 48 stalls, each 125 ft. long, and has brick enclosing walls, timber roof structure, and concrete floors and pits. The major items of remodeling work consisted of the construction of a 13-in. thick brick firewall to separate the three stalls from the remainder of the house; lowering the floor between the pits to an elevation of 2 ft. below top of rail; and construction of a servicing platform between tracks, at an elevation of 4 ft. 3½ in. above top of rail. The existing pit walls were retained, but the floors in the pits were lowered to an elevation of 4 ft. below top of rail.

The lowered concrete floor between pits is 80 ft. long 5 in. thick, reinforced with wire mesh, and pitched to three drains. Ramps are provided at the outer end and concrete stairs at the turntable end, to permit access to the depressed floor from the track-level floor.

The elevated platforms are 80 ft. long and vary from 5 ft. 6 in. to 15 ft. 2 in. in width. Construction consists of 5-in. I-beam columns set on concrete piers, 4-in. channel beams, and 3-in. thick plank decking spanning 6 ft. For the narrow portion of the platform, one row of steel columns is used, and for the wider portion two rows are used. At each end of the platform steel stairs are provided for access from track-level floor.

The building is heated by hot air from ducts under the floor. No change was made in this method of heating. Natural gravity



Remodeled roundhouse on IC provides servicing and repair facilities for diesel switchers.

ventilation is provided by two rows of clerestory windows located in a monitor. The steam locomotive smoke jacks were removed.

Converting Roundhouse and Adjacent Machine Shop

A project on the Chicago & North Western involved the conversion of a roundhouse and an adjacent machine shop. This is a 40-stall, 90-ft. brick roundhouse with attached 110-ft. by 140-ft. machine shop. Fourteen of the stalls are separated from the remainder of the roundhouse by a brick firewall, and this portion was converted into use for servicing diesels.

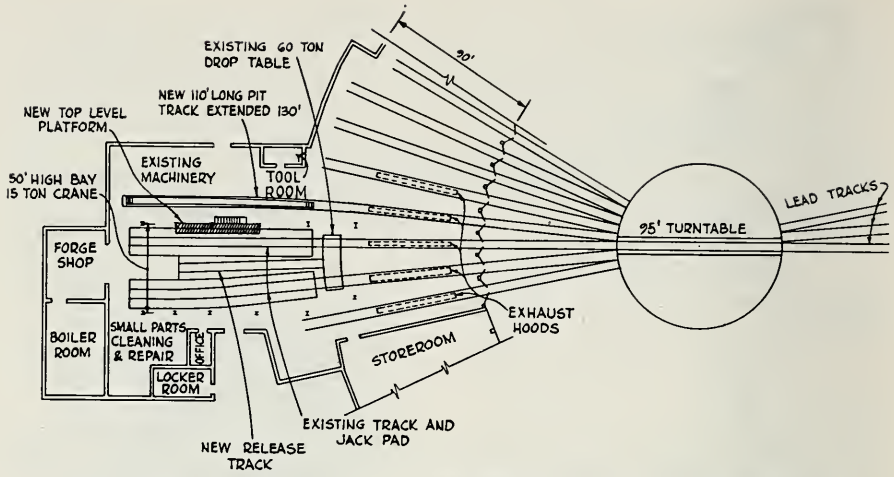
Two of the tracks extend through the roundhouse into the machine shop, where they are served by a 15-ton overhead crane in a 50-ft. by 140 ft. bay. The stalls are 200 ft. long and will accommodate coupled three-unit diesels, which is the largest type of power handled at this location. Access to these long stalls is provided from lead tracks on the opposite side of a 95-ft. turntable. Other diesels serviced at this location are switchers and road switchers which are serviced in the shorter stalls.

The conversion work consisted of the construction of a track 130 ft. long through the area in the machine shop formerly occupied by machinery that was no longer needed; construction of concrete pit for this additional track; purchase of four 35-ton locomotive jacks; and installation of additional ventilation, heating, and electric lighting.

The pit is of reinforced concrete with a depth of 4 ft. from top of rail. It is provided with stairs at both ends, recessed incandescent pit lights, and floor drains. Depressed floors and elevated platforms were not installed because filter and small parts cleaning space and storeroom are located at the track-level floor in an adjacent bay of the machine shop. Portable aluminum stairs are used to provide access from track-level floor to diesel engine room floor level.

The tracks in the two long stalls had existing reinforced concrete jacking pads 16 ft. wide by 100 ft. long in the high bay under the 15-ton crane. Four 35 ton locomotive jacks were installed in this area for use in jacking switchers and freight units so that trucks might be removed. Trucks are repaired at the ends of these two long tracks, or are moved by an existing locomotive driver drop table to a new release track constructed between the two long tracks.

The machine shop portion of the building



Roundhouse and adjacent machine shop converted for servicing diesels on C&NW.

was adequately ventilated by an existing ridge ventilator. In the roundhouse portion of the structure, a new ventilation system was installed in five stalls. This ventilation system consists of a hood 3 ft. wide by 2 ft. deep by 48 ft. long located on the center line of each track, at an elevation of 16 ft. above the top of rail. Above this hood is a duct 3 ft. wide by 1 ft. 6 in. deep by 48 ft. long. The baffle plate separating the hood from the duct has a continuous slot approximately ½ in. wide on each side, which allows fumes from diesel engines to be drawn from the hood into the duct. A 7000-c.f.m. exhaust fan, mounted on the roof, removes the fume-laden air from the duct and discharges it outside. The hood and duct are constructed of cement-asbestos board mounted on an angle-iron frame. Additional heating is supplied by floor-type steam heating units that supply heated air through short ducts directly into the engine pits.

The artificial lighting, in the entire area converted, was improved by the installation of mercury vapor and fluorescent fixtures.

Converting Steam Erecting Shop Into Heavy Diesel Repair Shop

On the Pennsylvania a longitudinal steam locomotive erecting shop was converted into a diesel servicing and heavy repair shop. This is an 82-ft. by 686-ft. brick building with gable-type roof, steel roof trusses, wood window sash and traveling cranes. During conversion of the building, the tracks, pits and floor were removed to facilitate construction of the new facilities for servicing, running maintenance, inspection and heavy repairs on all types of diesel locomotives.

Three longitudinal tracks were constructed on 32-ft. 6-in. centers; one track is of the stub type and the other two are of the through type. The entrances to the building were remodeled and provided with power-operated rolling steel doors.

The new facilities consist of inspection pits, depressed floors, elevated platforms, high-level platforms, drop pit, cross-over bridges, new heating and ventilating system, lighting, and the usual service piping. The rail is 155-lb section supported on 8-in.-H-beam columns spaced 5 ft. on centers, so that access to pits may be made from any point on the depressed floor.

The concrete inspection pits are 4 ft. 6 in. below top of rail, and are provided with steps to the track-level floor at the ends, and to the depressed floor at intermediate locations. The depressed concrete floor is 2 ft. 6 in. below top of rail along the greater portion of the two through tracks and a portion of the stub track. Floor is at rail height on the stub track in the heavy repair section and at each end of building on all tracks. There are concrete ramps located between the depressed floors and track-level floors.

There are two elevated platforms each 520 ft. long and one 240 ft. long. The platforms are 4 ft. 11 in. above top of rail. They are constructed of a cantilevered steel frame; and steel-deck flooring with a 2-in. topping of concrete. There is a top-level platform 520

ft. long and 14 ft. above top of rail to provide a working floor near the roof of the diesel units. It is of similar construction to the elevated platforms. There are steel stairs between the various platforms and track-level floor.

Two tracks and a short release track are served by a 90-ton, 23-ft. 6-in. drop table. The drop table is provided with body supports. There are three cross-over bridges, one each over the three tracks, located approximately in the center of the shop building.

The heating system consists of steam unit ventilators which temper fresh air. These heaters are located along the exterior wall of the building and introduce the heated fresh air at a level 32 ft. above the floor. Additional heating is provided by steam unit heaters located on the underside of the elevated platforms. Exhaust ventilation is provided by 48-in. power roof ventilators on 50-ft. centers on the ridge of the roof.

Lube oil, cold water, high pressure steam and compressed air enter the building in a pipe tunnel from various existing facilities. Piping in the diesel shop is located on the underside of the elevated platforms. Lube oil dispensers are located at intervals on the elevated platform. Service outlets for the other piping are located at frequent intervals in access holes in the elevated platform and on the underside of same.

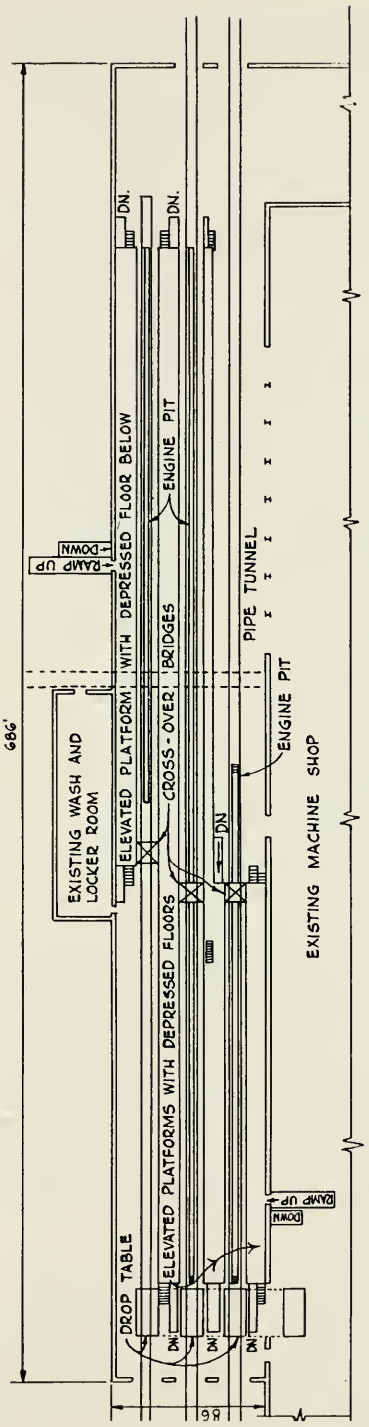
The existing cranes have been utilized throughout the entire length of the shop. The 75-ton crane rails are 25 ft. above the floor and the 5-ton crane rails are 18 ft. above the floor. Cranes are used for pulling cylinders, removing diesel engines, trucks and other parts.

Lighting for the depressed floor area is provided by fluorescent fixtures mounted on the underside of the elevated platform. Pit lighting is incandescent and the fixtures are located in receptacles recessed in the concrete pit walls. General lighting is from combination mercury vapor and incandescent fixtures mounted on the lower chord of the roof trusses.

Filter and small parts cleaning room, store room, electrical repair shop and welfare facilities are located in adjacent existing buildings.

Conversion of Transverse Steam Erecting Shop

On the Chicago & Eastern Illinois a transverse steam locomotive erecting shop has been converted into a diesel shop. This is a



Steam erecting shop on PRR converted to heavy diesel repair shop.

138-ft. by 619-ft. steel frame and brick building with wood windows and clay tile roofing. The building consists of a 75-ft. by 619-ft. highbay with gable-type roof, and two 31-ft. by 619-ft. bays to the north of the high bay, with flat roofs and saw-tooth monitors. The high bay is served by a 100-ton and a 10-ton overhead crane. Immediately south of the high bay on the outside is a 60-ft. transfer table which serves this building and the coach shop. Track centers in the building are 22 ft. apart.

The important work done in conversion consisted of providing direct access to the building; and the construction of inspection pits, depressed floor, elevated platforms, drop table, offices, filter and parts cleaning rooms, tool room, electrical shop, engine repair shop storeroom, and ramps. This shop provides for servicing, inspection, light repairs and heavy repairs. The shop has been in service for several years and the railroad is satisfied that it adequately meets the need for maintenance of diesel locomotives.

To obtain access to the shop without using the transfer table four new tracks were constructed, entering the north wall of the building at the west end. These tracks are on 20-deg. curves to bring them from a lead track parallel with the long length of the building to a position parallel to the short length of the building. Two new elevated sand tanks serve these four tracks, sand being supplied to tanks from an existing sand house. The fueling of locomotives is also done on these tracks on the north side of the shop.

These four tracks at the west end of the building comprise the servicing section of the shop. New power-operated rolling steel doors were installed in the north wall, and existing doors were left in place in the south wall to provide access to the transfer table. After using the shop for several years it has been found that rarely is it necessary to remove locomotives through the south doors to the transfer table and that the stub-type shop arrangement is no deterrent to efficient diesel servicing.

All heavy repair work is done in the bays immediately east of the four-track service section. No major work was required to convert the existing steam locomotive erection shop in this area into the heavy repair section. Locomotives must be moved to these bays via the transfer table, but since heavy repair work may take from several days to several weeks, it has been found that the transfer table causes no inconvenience.

The inspection pits are reinforced concrete and are 4 ft. deep below top of rail, with access stairs at the north end. Rail is 155-lb. section supported on H-beam columns spaced 5 ft. on centers. Depressed floor adjacent to the pits and under the elevated platform is 2 ft. 6 in. below top of rail.

The three elevated platforms are reinforced concrete 11 ft. wide and 4 ft. 11 in. above top of rail. They consist of one row of columns with cantilevered floor on each side. Access to the track level is provided by stairs and concrete ramps, and to depressed floor level by steel stairs. There is no top-level platform.

The 90-ton shallow type drop table serves one track in the service section, one track is heavy-repair section and one release track. The drop table is provided with the usual body supports.

The track was removed from the westerly bay and concrete floors were constructed at depressed and elevated platform levels. The lower or depressed level is used for parts and oil storage. The upper or platform-level floor contains offices for the shop foreman and caller, a filter and parts cleaning room, a tool room, sanitary facilities, and a small parts reconditioning room. Walls are built of light-weight concrete blocks, and the ceiling over these rooms consists of acoustically treated lightweight concrete roof slabs.

A 60-ft. by 66-ft. electrical shop was constructed in the low-bay area east of the servicing section. Walls are concrete block, extending to the roof. A small office was provided for the electrical foreman. A ⅓-ton jib crane, and chain hoists operating on a monorail, were installed to facilitate moving the electrical equipment to the varnishing oven, balancing machine, buffers, work benches and other special types of electrical repair equipment. The shop does all types of electrical repair work except rewinding of main generators.

Directly east of the electrical shop is a 22-ft. by 50-ft. diesel engine repair room where engines are completely rebuilt. To the east of this room is a 44-ft. by 66-ft. storeroom. These rooms are separated from the remainder of the shop by concrete block walls so that dirt or other foreign substances will not damage the parts.

The lighting fixtures were installed in the

remodeled portion of the shop. The servicing section is illuminated with mercury vapor lights on wall brackets, and on standards on the elevated platforms. The areas beneath the elevated platforms are illuminated with fluorescent fixtures, and the pits are illuminated with explosion-proof incandescent fixtures. Other rooms have incandescent and fluorescent lighting.

The building is heated by steam unit heaters located along the side walls, under the elevated platforms and near the four rolling steel doors. The latter heaters automatically start when the doors are opened.

Three power exhaust ventilators were placed over each of the four servicing tracks, effectively removing the diesel exhaust fumes. Asbestos-cement boards 4 ft. wide were placed on the underside of the existing wood roof decking on the center line of the servicing tracks to prevent the creation of a fire hazard caused by oil accumulation on the wood decking.

The service section has outlets for electric power, high-pressure steam, treated water, raw water, and compressed air. Three lube oil outlets are provided on each elevated platform, for the three different kinds of oil used. Oil is piped from an oil house approximately 100 ft. away. Used oil drains are located at convenient intervals along the running rail of the four servicing tracks. Used oil is piped from these drains to an underground storage tank.

The interior of the shop presents a light and clean appearance due to the color scheme and good housekeeping. The walls in the shop section have a grey dado about 4 ft. high, the remainder being yellow. Office walls are blue-green and ceilings yellow. The various pipe lines are painted different colors as a means of indicating their use.

Discussion

In answer to a question raised by E. H. Barnhart (B&O) as to whether or not any consideration is given to the disposition of waste oil that is drained from diesel locomotives, and which may incite protests from city authorities because of pollution of streams, Chairman Armstrong stated that the used oil should be pumped into tank cars and hauled away for reclamation. In some locations, he said, it is necessary to install oil separators. Leaky pipe joints, he added, are a common source of contamination because surface drainage carries the oil to streams. The best way to stop this, he continued, is by seeking the cooperation of the mechanical forces in observing good housekeeping practices.

F. D. Day (PRR) wondered if enough consideration was being given to the cost of converting old enginehouses for diesel operation. He thought that the cost of a new roof, the construction of fire walls, etc., should make a new building financially attractive. Chairman Armstrong agreed that the conversion of such buildings for the heavy repairs to diesels was not too satisfactory because the overhead cranes were generally too low to lift an engine out of a locomotive and still provide adequate clearance. In such instances, he said, a new building would be justified.

W. A. Huckstep (MP) wanted to know if the ventilating system described in the report as being installed 16 ft. above the floor was satisfactory for permitting heavy engine repairs. Chairman Armstrong said that no heavy repairs were carried out at this point. M. A. Matthews (SL-SF) said that he had obtained good ventilation in a converted enginehouse by installing monitors and power-operated fans.

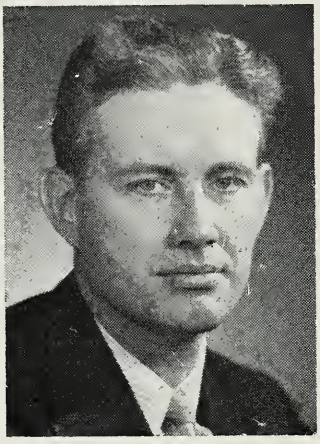
C. E. Garcelon (B&A) asked if a new roof was a necessity for converted enginehouses, and Chairman Armstrong stated that they should always be given consideration. Mr. Day stated that he recommends that a new roof be installed on all converted enginehouses.

W. H. Huffman (C&NW) stated that the decision for converting an old enginehouse to diesel maintenance is often a decision of management and is sometimes made for reasons of financial accounting, i.e., between capital and operating expenses.

Furnishing Water Under Emergency Conditions *

Report of Committee

COMMITTEE—E. R. SCHLAF, *Chairman*, asst. supv. w.s., IC, Chicago; R. F. BUSH, *Vice-Chairman*, w.s. supv., T&NO, Ennis, Texas.; W. R. WEAVER, *Vice-Chairman*, asst. gen. supt., P&S, Kittanning, Pa.; P. H. EVERETT, asst. supv. fire prev., IC, Chicago; J. A. JORLETT, asst. engr., PRR, New York; G. E. MARTIN, supt. w.s., IC, Chicago; R. L. MYERS, supt. w.s., IC, Clarksdale, Miss.; R. M. SCHMIDL, assoc. ed., Railway Age, Chicago; J. H. STINEBOUGH, supt. w.s., IC, Carbondale, Ill.; F. O. MCGREW, ch. carp., CMStP&P, Terre Haute, Ind.; J. M. SHORT, gen. w.s. insp., T&P, Dallas, Tex.



E. R. Schlaf
Chairman

The scope of this subject is intended to cover methods of furnishing water for all railroad purposes under extreme conditions such as washouts, floods, fires and major disasters of all kinds. This includes water for power, sanitation, drinking, culinary purposes, fire fighting and heating.

The current shifting of political forces in the world today, coupled with rapid strides in the development of long range air power, has increased the vulnerability of this country to aerial attack. This, along with the usual frequency of floods, fires, sleet and windstorms, makes the problem of the transmission of electric energy through power lines and the transmission of water through pipe less dependable than ever before.

The best method of coping with emergencies is to become thoroughly familiar with the water system beforehand. This should include:

(a) Investigation of the reliability of the water source.

(b) A check of the performance of pumping equipment as to its efficiency and condition.

(c) A check of the performance and condition of the power, whether steam, air, electric, gas, gasoline or diesel fuel.

(d) A survey of the distribution system with revision and improvement of records and maps.

(e) Inspection of elevated and pressure-type storage facilities.

(f) Inspection of all fire-fighting equipment, including alarm systems, fire trucks, hydrants, hose, etc.

(g) A survey to develop the possibility of pollution under unusual conditions.

(h) A survey to determine alternate or supplemental power and water sources.

In most water systems there is a "bottleneck." For normal demand it may not be serious, but in an emergency it may interfere and cause many hardships. This may be caused by many factors. For example, in a well supply it may be a tight water-bearing formation, a well screen that is plugged or of incorrect slot size and length, well casing too small, pump too small, pump set too shallow, power limitations, discharge pipe friction too high, etc. In conducting the plant survey, it should be borne in mind that once a bottleneck is broken a new one usually arises. It is well to note, therefore, how much could be gained by correcting each one before proceeding with the work.

Reservoirs require periodic inspection with additional checks after periods of high water. If seepage is noted, it should be watched carefully for evidence of increase in volume. Trash and debris blocking a spillway can

* After this report had been prepared the Federal Civil Defense Administration released a technical manual entitled "Operation and Repair of Water Facilities in Civil Defense Emergencies." Primarily, this booklet covers problems that may be incurred due to enemy attack either by conventional or atomic bombs or by biological or chemical warfare. Interested persons may obtain copies from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. The price is 25 cents per copy.

cause overtopping and failure of the structure. All gates and other outlets should be inspected, lubricated and repaired when necessary. Earthen embankments should be kept neat and slopes well sodded and graveled. Muskrats sometimes burrow into earthen embankments, and it is well to encourage the trapping of these rodents. Many reservoirs silt badly, and it is desirable to check the rate of deposit, with a view of possibly raising the dam level, and acquiring additional property, thus increasing the storage capacity.

For wells, the static level of the water should be ascertained periodically and recorded. This provides excellent information for the determination of the underground water supply in the area. When properly interpreted and appropriate action taken, an emergency can usually be easily prevented.

The drawdown of the well provides equally interesting information, provided previous readings have been recorded. An increase in the drawdown usually indicates stoppage of the screen or the aquifer in which it is set. Stoppage of the screen can be caused by chemical deposits due to dropping of the head in the well, sand entering and choking the screen and clay deposits from the above sand bed of the well.

Surface supplies may dwindle in periods of drought; algae, sand, leaves and other debris may provide intake troubles. Studies should be made of these difficulties and corrections made before an emergency condition arises.

Pumping Equipment

The frequency of inspection and servicing of pumping equipment will depend upon the type, construction, usage and operating importance of each unit. Deep-well turbine pumps of the water-lubricated type require little maintenance; the important requirement is to keep the shaft bearings wet at all times. This is best done by installing a foot valve. Oil-lubricated turbine pumps require more frequent attention. Standard equipment is a one-quart solenoid-operated automatic oiler, but this can be replaced with one of twice the capacity.

Surface centrifugal pumps should be checked for packing-gland difficulties. Excessive tightness will cause scoring of shaft sleeves and excessive consumption of power. Periodic inspection should include removal and cleaning of packing glands, draining and refilling of oil lubricated bearings and lubrication of bell and roller bearings strictly according to the instructions of the manufacturer. Couplings should be checked.

Performance tests should be made of all pumps and compared with manufacturer's performance tests or previous performance results. It is always desirable, though sometimes impractical, to conduct these tests under actual field conditions.

Air-lift pumps, in general, require very little attention. Regular checks should be made of the static water level in order to determine correct submergence for highest efficiency.

Motors

Electric motors, internal combustion engines and steam engines should receive systematic maintenance and servicing similar to that of pumps. Dirt, lack of oil and worn parts will accelerate wear and overheating.

It is not uncommon to find overload relays of too high rating in motor starting devices. In times of emergency when low voltage may exist, this will sometimes cause the motor to burn out. Improper size overloads, therefore, can cause emergencies themselves, and the proper size overloads should always be provided.

Water Mains, Records and Maps

The operating condition of a distribution system is of the utmost importance during an emergency or disaster. Mains should be kept in condition to carry a maximum amount of water. Valves that are supposed to be open should be kept open; fire hydrants and valves should be kept in good condition; all valve boxes and manholes should be accessible.

Reports made by the National Board of Fire Underwriters have repeatedly demonstrated the importance of valve inspection. In many instances surveys have revealed closed or partially closed valves in important mains and feeders. Fire flow tests have demonstrated the reduction of carrying capacity caused by incrustation or other obstruction within the main. Similar surveys have shown leakage responsible for wastage of thousands of gallons of water daily. The elimination of these conditions is necessary if the maximum carrying capacity of any water system is to be attained.

Oftentimes it is found that insufficient care was taken in making maps showing water mains. This has caused a great deal of confusion and expense in locating them at the time needed. Modern pipe locators, however, have removed most of the guesswork from this task. Maps should be

brought up to date and corrected, if need be, by checking the actual location of pipe lines with the locator. In addition to the comprehensive map, large scale sectional plats showing details should be made.

The comprehensive map should indicate readily the areas adequately supplied, areas poorly supplied, and areas where short extensions would eliminate dead ends. It should indicate valve positions, which information is of utmost importance in shutting off broken mains. The detail map should show by-passes, cross-connections, and valve clusters near pumping units.

Of utmost importance is the determination of the direction of closure of valves. Most valves are closed by turning in a clockwise direction. However, exceptions are sometimes found and these should be brought to the attention of all concerned. Valves should be periodically closed and opened, noting the number of turns required to close the valve. This figure should be recorded and compared with previous records.

The actual hydraulic performance of a distribution system may be studied by field tests and pressure surveys. These tests may then be made the basis of hydraulic calculations for extensions, reinforcements, new layouts or cleaning. The rate of discharge from a hydrant is generally obtained by measuring the jet velocity with a pitot tube and gage. When the flow and pressure drop through mains is obtained, the friction loss should be compared with standard friction loss tables. Undue friction losses are usually attributable to scale, tuberculation and corrosion on the internal surfaces of the pipe, partially closed valves, obstructions in elbows or poorly-poured lead joints.

Storage Facilities

Many times in an emergency it will be found that the only water immediately available for use is in the storage facilities. It is then that the supply is rationed carefully and estimates made as to the length of time before the supply is exhausted. Oftentimes it will be found that the liquid-level controlling device, whether it be a float valve, float switch, altitude valve or probe-type control, has not been functioning properly and has not permitted the vessel to fill to its maximum capacity. This reduces its efficiency and increases the need for immediate restoration to service of the pumping facilities. Therefore, storage facilities should be periodically checked to determine whether controlling devices are operating properly.

Tanks should be cleaned periodically according to the need at each particular point to prevent sand and mud from entering the mains if the tank water level should drop unduly. Pressure-type tanks should be inspected and tested periodically. Care should be taken to keep the air-water ratio in proper proportions to prevent loss of volume by air-binding and too frequent starting of the pump by waterlogging.

Fire Fighting Equipment

One of the greatest causes of emergencies is fire. An efficient firefighting system is essential to the protection of large railroad installations. In addition to the need for water mains of adequate capacity properly spaced hydrants, hose houses and fire alarm systems are essential. Most railroads have organized fire brigades at terminals which conduct fire drills at different locations and note water pressures at various hydrants. These drills should indicate any weak spots in the fire-fighting system so that corrective action may be taken. The fire hydrant main should be hydrostatically tested at a pressure from 25 to 50 per cent above normal to discover weak points in the mains. Cast iron pipe under certain conditions will lose considerable strength. Any pipe found in this condition should be replaced and investigation made as to the cause of failure. Stray currents may be responsible and should be eliminated to avoid repetition of pipe failure.

Cross Connections

Many cross-connections with polluted sources may be found on railroads. Sometimes a fire pump having two sources of supply, one unsafe, can pollute the entire system. Flushometer toilets without vacuum breakers are constant potential hazards. Submerged water supplies to processing tanks are also dangerous. One factory was found to have a city water line leading into the bottom of a huge cyanide vat. Any situation causing a vacuum on the city line while it was open to the vat could have caused many deaths. Thus, it can be seen that a system which works perfectly while water pressures are normal can fail under unusual conditions.

Supplemental Power and Water Sources

Should the regular power or water supply fail, alternate or supplemental sources must be put into service. Standby motors and engines, portable pumps, air compressors, portable electric generators, tank trucks and tank

cars are some of the types of equipment used.

If the electric power supply should fail, the use of a portable generator is an excellent alternate source. Care should be taken to determine that the generator is adequate for the load. Turbine well pumps with vertical motor and supplemental engine with right-angle drive are ideal. A portable self-priming trench pump with gasoline engine drive is a versatile type of equipment. Care should be taken to determine its actual performance under various head conditions. Suction should be limited to 15 ft. for good performance. Sometimes it is desirable to hook up two or more portable centrifugal pumps in series to increase the discharge head. An air-tight suction hose is not necessary, but certainly desirable for maximum performance.

Portable air compressors are also versatile. Air may be used to drive steam pumps in the event of steam supply failure. Wells may be quickly equipped with an air lift by immersing the air line to a suitable percentage of submergence which varies from 40 to 70, depending upon the distance between the pumping level and the discharge. Air-lift pumps perform best when the pumping level is relatively shallow and the discharge head is low. This suggests air lifting the water to the surface into a pool and rehandling with a surface pump. There are a number of auxiliary lift pumps on the market for use in fire department operation.

The hauling of water by tank cars to points needed on a railroad is always expensive and is usually the last resort. Train loads of water may be unloaded rapidly by means of a wood trough, lined with roofing paper and placed either between the rails or alongside the track and leading to a basin from which the water is pumped to elevated facilities or directly to engine tenders. A header pipe may be used in place of the trough, with a self-priming pump connected directly to it.

It may become necessary to obtain a temporary supply from a small stream. Sand bags may be put to good use in impounding the water, thus increasing the supply and decreasing suction problems. Plain-end pipe with quick-type clamp couplings can be quickly laid on the surface with a minimum of labor.

Should the quality of water taken from the temporary supply cause foaming of locomotive boilers, the hand application of antifoam compounds may be required. There have been instances where oil field brine pits have overflowed into reservoirs, resulting in engine failures. When this occurs, the trouble may sometimes be easily corrected by opening the drain valve in the bottom of the reservoir. The heavier brine tends to stratify and if removed immediately will not contaminate the entire supply.

The fighting of fires sometimes requires tremendous quantities of water. It must be assumed that in certain instances even the most well-planned installations will be hopelessly inadequate. During such periods the use of untreated surface supplies will be used. This brings with it the problem of disinfecting mains and chlorinating the supply.

Proper disinfection requires that the disinfectant used, generally chlorine in one of its forms, be uniformly dispersed throughout the system and that it reach all surfaces to be treated in sufficient concentration and for a period long enough to destroy all bacteria. The contact period for proper disinfection depends upon the dosage and the distribution of polluted material that must be penetrated. For thoroughly flushed surfaces a contact period of 4 to 24 hours is usually recommended for a dosage of 50 p.p.m. of chlorine. The contact period may be reduced to 1 hour by increasing the chlorine dosage to 100 to 200 p.p.m.

Methods of introducing chlorine into water mains are:

(a) Injection of hypochlorite solution with a force pump or a hypochlorinator.

(b) Injection of chlorine solution with a gas chlorinator.

(c) Injection of chlorine gas direct from a cylinder.

(d) Placement of hypochlorite powder or paste in the main.

Disinfection of grossly contaminated mains may be facilitated by first injecting a heavily chlorinated (250 or 350 p.p.m.) "slug" of water into the lines followed by water containing 50 p.p.m. of chlorine, the heavily-dosed water moving toward the outlet where it is discharged. Entrapped air should be bled off at high points to permit all interior surfaces to be disinfected.

A one per cent hypochlorite solution (10,000 p.p.m.) may be prepared by dissolving 1¼ lb. of 70 per cent chlorine compound or 3½ lb. of 25 per cent chlorine compound in 10 gals. of water. This solution can be used to treat 100 ft. of pipe with a 50 p.p.m. chlorine dosage according to the following table:

Pipe Size in Inches	One-Per Cent Chlorine Solution
2	⅔ pint
4	2½ pint
6	3 qt.
8	5 qt.
10	2 gals.
12	3 gals.
16	5¼ gals.
20	8¼ gals.
24	11¾ gals.

The chlorine residual after the contact time should be at least 5 p.p.m.

The most satisfactory method of applying chlorine to a water main is injection of a solution of water and chlorine by means of a portable gas chlorinator. The procedure for disinfecting mains by this method is similar to that outlined for hypochlorite solution feed.

If chlorinators are not available, gaseous chlorine may be injected directly into the main from a chlorine cylinder. A disadvantage of this method is in the control of the rate of feed and obtaining good diffusion. Great care must be used to prevent entrance of water into the cylinder as a result of pressure changes in main and cylinder. Pressure in the main should not exceed 25 p.s.i., and the rate of discharge should not exceed 40 lb. in 24 hrs. This method of chlorination is recommended only in case of an emergency.

The disinfection of mains by means of hypochlorite powder or paste is not recommended because of irregularity of concentration. However, if no other facilities are available, mains may be dosed according to the following table. The amounts shown in the table will give a 50 p.p.m. dosage for 100 ft. of pipe.

Pipe Size in Inches	Ounces of 70-Per Cent Hypochlorite Powder	Ounces of 25-Per Cent Hypochlorite Powder
2	0.2	0.5
4	1.0	2.0
6	2.0	4.0
8	3.0	7.0
10	4.0	11.0
12	6.0	16.0
16	10.0	28.0
18	13.0	35.0
20	16.0	44.0
24	23.0	63.0
30	35.0	98.0

To disinfect water storage tanks properly it is necessary to scrub the inside surface to remove organic matter which may prevent the disinfectant from reaching the surface to be treated. Chlorine may be added by direct application of a strong solution to the surface, chlorination of the water as it enters the tank, or direct application to the filled tank. Below is given dosages for various sizes of tanks to secure 50 p.p.m. chlorine:

Capacity in Gallons	Pounds of 70-Per-Cent Hypochlorite Powder	Pounds of 25-Per Cent Hypochlorite Powder
1,000	0.6	1.7
5,000	3.0	8.3
10,000	6.0	16.7
20,000	12.0	33.3
40,000	24.0	66.7
60,000	36.0	100.0
80,000	48.00	133.0
100,000	60.0	167.0

Water for drinking and culinary purposes comprises a very small percentage of the total consumption. The disinfection of drinking water can be done by (a) boiling for 15 min. (b) chlorination, (c) iodine treatment. Any chlorine compound, paste, powder, liquid or gas may be used. Laundry bleach is ideal for treating a small quantity. Dosage should be approximately 16 drops of a 1 per cent solution per gallon of clear water, and ½ teaspoon per gallon for turbid water. If, after 15 to 30 min. contact time there is a residual of 0.3 to 0.5 p.p.m. the water is safe. Should objection arise as to the chlorine taste, this may be eliminated by adding a small crystal of sodium thiosulfate (photographic "hypo").

If chlorine in any of its forms is not available, U.S.P. tincture of iodine may be used to purify small quantities of water. Add 2 to 3 drops per quart of clear water (8 to 10 drops for turbid water) and let stand for 30 min. Iodine is generally considered less effective than chlorine.

Conclusion

In order to handle a water supply satisfactorily in an emergency, necessary arrangements for men and equipment and a plan of attack must be made in advance.

The plans of a water service engineer who has had the opportunity to survey the possibilities will do much to solve a water emergency. The possible supplies that might be used should be known and suitable needed equipment and material should be on hand or readily accessible. It may be necessary to use water of lower quality if the supply is adequate. However, the character of an emergency supply must be adaptable for the purpose required.

Past Officers

	1891-2	1892-3	1893-4	1894-5
President	O. J. Travis	H. M. Hall	J. E. Wallace	Geo. W. Andrews
1st V.-Pres.	H. M. Hall	J. E. Wallace	Geo. W. Andrews	W. A. McGonagle
2nd V.-Pres.	J. B. Mitchell	G. W. Hinman	W. A. McGonagle	L. K. Spafford
3rd V.-Pres.	James Stannard	N. W. Thompson	L. K. Spafford	James Stannard
4th V.-Pres.	G. W. Hinman	C. T. Fuller	E. D. Hines	Walter G. Berg
Secretary	C. W. Gooch	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	George M. Reid	George M. Reid	George M. Reid	George M. Reid
Executive Members	W. R. Damon	G. W. Andrews	Q. McNab	James Stannard
	G. W. Markley	J. M. Staten	A. S. Markley	James H. Travis
	W. A. McGonagle	J. M. Caldwell	Floyd Ingram	J. H. Cummin
	C. W. McGehee	Q. McNab	James Stannard	R. M. Peck
	G. W. Turner	Floyd Ingram	James H. Travis	J. L. White
	J. E. Wallace	A. S. Markley	J. H. Cummin	A. Shane

	1895-6	1896-7	1897-8	1898-9
President	W. A. McGonagle	James Stannard	Walter G. Berg	J. M. Cummin
1st V.-Pres.	L. K. Spafford	Walter G. Berg	J. H. Cummin	A. S. Markley
2nd V.-Pres.	James Stannard	J. H. Cummin	A. S. Markley	C. C. Mallard
3rd V.-Pres.	Walter G. Berg	A. S. Markley	G. W. Hinman	W. A. Rogers
4th V.-Pres.	J. H. Cummin	R. M. Peck	C. C. Mallard	J. M. Staten
Secretary	S. F. Patterson	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	George M. Reid	N. W. Thompson	N. W. Thompson	N. W. Thompson
Executive Members	R. M. Peck	W. O. Eggleston	G. J. Bishop	Wm. S. Danes
	J. L. White	W. M. Noon	C. P. Austin	J. H. Markley
	A. Shane	J. M. Staten	M. Riney	W. O. Eggleston
	A. S. Markley	G. J. Bishop	Wm. S. Danes	R. L. Heflin
	W. M. Noon	C. P. Austin	J. H. Markley	F. W. Tanner
	J. M. Staten	M. Riney	W. O. Eggleston	A. Zimmerman

	1899-1900	1900-1901	1901-1902	1902-1903
President	Aaron S. Markley	W. A. Rogers	W. S. Danes	B. F. Pickering
1st V.-Pres.	W. A. Rogers	W. S. Danes	B. F. Pickering	C. C. Mallard
2nd V.-Pres.	J. M. Staten	B. F. Pickering	A. Shane	A. Shane
3rd V.-Pres.	Wm. S. Danes	A. Shane	A. Zimmerman	A. Zimmerman
4th V.-Pres.	B. F. Pickering	A. Zimmerman	C. C. Mallard	A. Montzheimer
Secretary	S. F. Patterson	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	N. W. Thompson	N. W. Thompson	N. W. Thompson	N. W. Thompson
Executive Members	T. M. Strain	T. M. Strain	A. Montzheimer	W. E. Smith
	R. L. Heflin	H. D. Cleaveland	W. E. Smith	A. W. Merrick
	F. W. Tanner	F. W. Tanner	A. W. Merrick	C. P. Austin
	A. Zimmerman	A. Montzheimer	C. P. Austin	C. A. Lichty
	H. D. Cleaveland	W. E. Smith	C. A. Lichty	W. O. Eggleston
	A. Montzheimer	A. W. Merrick	W. O. Eggleston	J. H. Markley

	1903-1904	1904-1905	1905-1906	1906-1907
President	A. Montzheimer	C. A. Lichty	J. B. Sheldon	J. H. Markley
1st V.-Pres.	A. Shane	J. B. Sheldon	J. H. Markley	R. H. Reid
2nd V.-Pres.	C. A. Lichty	J. H. Markley	R. H. Reid	J. P. Canty
3rd V.-Pres.	J. B. Sheldon	R. H. Reid	R. C. Sattley	H. Rettinghouse
4th V.-Pres.	J. H. Markley	R. C. Sattley	J. P. Canty	F. E. Schall
Secretary	S. F. Patterson	S. F. Patterson	S. F. Patterson	S. F. Patterson
Treasurer	C. P. Austin	C. P. Austin	C. P. Austin	C. P. Austin
Executive Members	R. H. Reid	W. O. Eggleston	H. Rettinghouse	W. O. Eggleston
	W. O. Eggleston	A. E. Killam	A. E. Killam	A. E. Killam
	A. E. Killam	H. Rettinghouse	J. S. Lemond	J. S. Lemond
	R. C. Sattley	J. S. Lemond	C. W. Richey	C. W. Richey
	H. Rettinghouse	W. H. Finley	H. H. Eggleston	H. H. Eggleston
	J. S. Lemond	C. W. Richey	F. E. Schall	B. J. Sweatt

	1907-1908	1908-1909	1909-1910	1910-1911
President	R. H. Reid	J. P. Canty	H. Rettinghouse	H. Rettinghouse
1st V.-Pres.	J. P. Canty	H. Rettinghouse	J. S. Lemond	F. E. Schall
2nd V.-Pres.	H. Rettinghouse	F. E. Schall	F. E. Schall	A. E. Killam
3rd V.-Pres.	F. E. Schall	J. S. Lemond	A. E. Killam	J. N. Penwell
4th V.-Pres.	W. O. Eggleston	A. E. Killam	J. N. Penwell	L. D. Hadwen
Secretary	S. F. Patterson	S. F. Patterson	C. A. Lichty	C. A. Lichty
Treasurer	C. P. Austin	C. P. Austin	J. P. Canty	J. P. Canty
Executive Members	A. E. Killam	J. N. Penwell	W. Beahan	T. J. Fullem
	J. S. Lemond	Willard Beahan	F. B. Scheetz	G. Aldrich
	C. W. Richey	F. B. Scheetz	L. D. Hadwen	P. Swenson
	T. S. Leake	W. H. Finley	T. J. Fullem	G. W. Rear
	W. H. Finley	L. D. Hadwen	G. Aldrich	W. O. Eggleston
	J. N. Penwell	T. J. Fullem	P. Swenson	W. F. Steffens

	1911-1912	1912-1913	1913-1914	1914-1915
President	F. E. Schall	A. E. Killam	J. N. Penwell	L. D. Hadwen
1st V.-Pres.	A. E. Killam	J. N. Penwell	L. D. Hadwen	G. Aldrich
2nd V.-Pres.	J. N. Penwell	L. D. Hadwen	G. Aldrich	G. W. Rear
3rd V.-Pres.	L. D. Hadwen	T. J. Fullem	G. W. Rear	C. E. Smith
4th V.-Pres.	T. J. Fullem	G. Aldrich	C. E. Smith	E. B. Ashby
Secretary	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Treasurer	J. P. Canty	J. P. Canty	J. P. Canty	F. E. Weise
Executive Members	G. Aldrich	G. W. Rear	W. F. Steffens	W. F. Steffens
	P. Swenson	W. F. Steffens	E. B. Ashby	S. C. Tanner
	G. W. Rear	E. B. Ashby	S. C. Tanner	Lee Jutton
	W. F. Steffens	C. E. Smith	Lee Jutton	F. F. Strouse
	E. B. Ashby	S. C. Tanner	W. F. Strouse	C. R. Knowles
	W. O. Eggleston	Lee Jutton	C. R. Knowles	A. Ridgway

	1915-1916	1916-1917	1917-1918	1918-1919
President	G. W. Rear	C. E. Smith	S. C. Tanner	Lee Jutton
1st V.-Pres.	C. E. Smith	E. B. Ashby	Lee Jutton	F. E. Weise
2nd V.-Pres.	E. B. Ashby	S. C. Tanner	F. E. Weise	W. F. Strouse
3rd V.-Pres.	S. C. Tanner	Lee Jutton	W. F. Strouse	C. R. Knowles
4th V.-Pres.	Lee Jutton	F. E. Weise	C. R. Knowles	A. Ridgway
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Executive Members	F. E. Weise	W. F. Strouse	A. Ridgway	J. S. Robinson
	W. F. Strouse	C. R. Knowles	J. S. Robinson	J. P. Wood
	C. R. Knowles	A. Ridgway	J. P. Wood	A. B. McVay
	A. Ridgway	J. S. Robinson	D. C. Zook	J. H. Johnston
	J. S. Robinson	J. P. Wood	A. B. McVay	E. T. Howson
	J. P. Wood	D. C. Zook	J. H. Johnston	C. W. Wright

	1919-1920	1920-1921	1921-1922	1922-1923
President	F. E. Weise	W. F. Strouse	C. R. Knowles	Arthur Ridgway
1st V.-Pres.	W. F. Strouse	C. R. Knowles	A. Ridgway	J. P. Wood
2nd V.-Pres.	C. R. Knowles	A. Ridgway	J. S. Robinson	J. S. Robinson
3rd V.-Pres.	A. Ridgway	J. S. Robinson	J. P. Wood	C. W. Wright
4th V.-Pres.	J. S. Robinson	J. P. Wood	C. W. Wright	E. T. Howson
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.			F. E. Weise	F. E. Weise
Directors	J. P. Wood	C. W. Wright	E. T. Howson	F. C. Baluss
	A. B. McVay	A. B. McVay	J. H. Johnston	Maro Johnson
	J. H. Johnston	G. A. Manthey	E. K. Barrett	O. F. Dalstrom
	E. T. Howson	E. T. Howson	F. C. Baluss	S. D. Corey
	C. W. Wright	J. H. Jonhston	Maro Johnson	W. B. Hotson
	G. A. Manthey	E. K. Barrett	O. F. Dalstrom	P. N. Nelson

	1923-1924	1924-1925	1925-1926	1926-1927
President	J. S. Robinson	J. P. Wood	C. W. Wright	E. T. Howson
1st V.-Pres....	J. P. Wood	C. W. Wright	E. T. Howson	F. C. Baluss
2nd V.-Pres....	C. W. Wright	E. T. Howson	F. C. Baluss	Maro Johnson
3rd V.-Pres....	E. T. Howson	F. C. Baluss	Maro Johnson	J. S. Huntoon
4th V.-Pres....	F. C. Baluss	Maro Johnson	J. S. Huntoon	C. S. Heritage
Sec.-Treas.....	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.....	F. E. Weise	F. E. Weise	F. E. Weise	F. E. Weise
Directors	S. T. Corey	J. S. Huntoon	C. S. Heritage	A. I. Gauthier
	W. B. Hotson	A. I. Gauthier	W. B. Hotson	E. L. Sinclair
	P. N. Nelson	E. L. Sinclair	P. N. Nelson	O. F. Dalstrom
	J. S. Huntoon	C. S. Heritage	A. I. Gauthier	W. T. Krausch
	A. I. Gauthier	W. B. Hotson	E. L. Sinclair	R. C. Bardwell
	E. L. Sinclair	P. N. Nelson	O. F. Dalstrom	H. I. Benjamin

	1927-1928	1928-1929	1929-1930	1930-1934
President.....	F. C. Baluss	Maro Johnson	J. S. Huntoon	C. S. Heritage
1st V.-Pres....	Maro Johnson	J. S. Huntoon	C. S. Heritage	A. I. Gauthier
2nd V.-Pres....	J. S. Huntoon	C. S. Heritage	A. I. Gauthier	H. I. Benjamin
3rd V.-Pres....	C. S. Heritage	A. I. Gauthier	H. I. Benjamin	W. T. Krausch
4th V.-Pres....	A. I. Gauthier	H. I. Benjamin	W. T. Krausch	T. H. Strate
Sec.-Treas.....	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.....	F. E. Weise	F. E. Weise		
Directors	W. T. Krausch	R. C. Henderson	G. A. Rodman	E. C. Neville
	R. C. Bardwell	J. S. Ekey	W. A. Batey	H. H. Best
	H. I. Benjamin	T. H. Strate	F. W. Hillman	J. E. King
	R. C. Henderson	G. A. Rodman	E. C. Neville	A. B. Scowden
	T. H. Strate	W. A. Batey	H. H. Best	W. A. Batey
	J. S. Ekey	F. W. Hillman	J. E. King	L. C. Smith

	1934-1935	1935-1936	1936-1937	1937-1938
President.....	H. I. Benjamin	T. H. Strate	E. C. Neville	C. M. Burpee
1st V.-Pres....	T. H. Strate	E. C. Neville	C. M. Burpee	F. H. Masters
2nd V.-Pres...	E. C. Neville	C. M. Burpee	F. H. Masters	W. S. Lacher
3rd V.-Pres....	A. B. Scowden	F. H. Masters	C. A. J. Richards	C. A. J. Richards
4th V.-Pres....	W. R. Roof	C. A. J. Richards	W. S. Lacher	F. H. Cramer
Sec.-Treas....	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Directors	C. M. Burpee	A. L. McCloy	W. R. Roof	B. R. Meyers
	W. A. Batey	R. P. Luck	T. P. Soule	G. S. Crites
	L. C. Smith	H. H. Best	F. H. Cramer	R. E. Dove
	C. A. J. Richards	W. R. Roof	B. R. Meyers	T. P. Soule
	A. L. McCoy	T. P. Soule	G. S. Crites	A. Chinn
	R. P. Luck	F. H. Cramer	R. E. Dove	L. G. Byrd

	1938-1939	1939-1940	1940-1941	1941-1942
President.....	Armstrong Chinn	A. E. Bechtelheimer	H. M. Church	R. E. Dove
1st V.-Pres....	F. H. Cramer	F. H. Cramer	R. E. Dove	F. H. Soothill
2nd V.-Pres....	A. E. Bechtelheimer	H. M. Church	F. A. Soothill	G. S. Crites
3rd V.-Pres....	H. M. Church	R. E. Dove	G. S. Crites	A. M. Knowles
4th V.-Pres....	R. E. Dove	F. H. Soothill	A. M. Knowles	N. D. Howard
Sec.-Treas.....	C. A. Lichty	C. A. Lichty		
Secretary.....	.....	.....	F. O. Whiteman	A. G. Shaver
Treasurer.....	.....	.....	F. E. Weise	F. E. Weise
Directors	L. G. Byrd	B. R. Meyers	N. D. Howard	R. E. Caudle
	W. R. Ganser	W. Walkden	L. G. Byrd	I. A. Moore
	F. H. Soothill	A. S. Krefting	K. L. Miner	W. A. Sweet
	B. R. Meyers	A. M. Knowles	R. E. Caudle	J. L. Varker
	W. Walkden	L. G. Byrd	I. A. Moore	L. E. Peyser
	A. S. Krefting	K. L. Miner	W. A. Sweet	Martin Meyer

	1942-1943	1943-1944	1944-1945	1945-1946
President	G. S. Crites	J. L. Varker	J. L. Varker	N. D. Howard
1st V.-Pres.	R. E. Caudle	R. E. Caudle	R. E. Caudle	F. G. Campbell
2nd V.-Pres.	A. M. Knowles	N. D. Howard	N. D. Howard	J. S. Hancock
3rd V.-Pres.	N. D. Howard	F. G. Campbell	F. G. Campbell	E. H. Barnhart
4th V.-Pres.	J. L. Varker	J. S. Hancock	J. S. Hancock	W. F. Martens
Secretary	A. G. Shaver†	Elinor V. Heffern	Elise LaChance	Elise LaChance
	Lorene Kindred‡			
	Elinor V. Heffern			
Treasurer	F. E. Weise	C. R. Knowles	C. R. Knowles	C. R. Knowles
Treasurer Emeritus		F. E. Weise	F. E. Weise	
Directors	M. Meyer	W. F. Martens	W. F. Martens	A. B. Chapman
	L. E. Peyser	A. L. McCloy	A. L. McCloy	W. A. Huckstep
	K. L. Miner	L. C. Winkelhaus	L. C. Winkelhaus	F. R. Spofford
	F. G. Campbell	E. H. Barnhart	E. H. Barnhart	Guy E. Martin
	J. S. Hancock	A. B. Chapman	A. B. Chapman	B. R. Meyers
	L. C. Winkelhaus	L. E. Peyser	L. E. Peyser	L. E. Peyser

†To November 1, 1942
‡To February 1, 1943

	1946-1947	1947-1948	1948-1949	1949-1950
President	F. G. Campbell	J. S. Hancock	E. H. Barnhart	W. F. Martens
1st V.-Pres.	J. S. Hancock	E. H. Barnhart	W. F. Martens	W. A. Huckstep
2nd V.-Pres.	E. H. Barnhart	W. F. Martens	W. A. Huckstep	Guy E. Martin
3rd V.-Pres.	W. F. Martens	W. A. Huckstep	Guy E. Martin	F. R. Spofford
4th V.-Pres.	W. A. Huckstep	G. E. Martin	F. R. Spofford	Lee Mayfield
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	C. R. Knowles	C. R. Knowles	L. C. Winkelhaus	L. C. Winkelhaus
Directors	Guy E. Martin	H. M. Harlow	Lee Mayfield	H. M. Harlow
	B. R. Meyers	H. B. Christianson	F. M. Misch	V. E. Engman
	L. E. Peyser	F. R. Spofford	W. D. Gibson	G. W. Benson
	H. M. Harlow	Lee Mayfield	H. M. Harlow	F. M. Misch
	H. B. Christianson	Franz M. Misch	V. E. Engman	L. R. Morgan
	F. R. Spofford	W. D. Gibson	G. W. Benson	J. A. Jorlett

	1950-1951	1951-1952	1952-1953
President	W. A. Huckstep	Guy E. Martin	F. R. Spofford
1st V.-Pres.	Guy E. Martin	F. R. Spofford	Lee Mayfield
2nd V.-Pres.	F. R. Spofford	Lee Mayfield	H. M. Harlow
3rd V.-Pres.	Lee Mayfield	H. M. Harlow	J. A. Jorlett
4th V.-Pres.	H. M. Harlow	J. A. Jorlett	R. R. Gunderson
Secretary	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	L. C. Winkelhaus	L. C. Winkelhaus	L. C. Winkelhaus
Directors	F. M. Misch	M. H. Dick	W. H. Huffman
	L. R. Morgan	R. R. Gunderson	L. R. Morgan
	J. A. Jorlett	J. F. Warrenfells	B. M. Stephens
	M. H. Dick	W. H. Huffman	M. H. Dick
	R. R. Gunderson	L. R. Morgan	J. F. Warrenfells
	J. F. Warrenfells	B. M. Stephens	G. Switzer

CONSTITUTION

ARTICLE I.

NAME

Section 1. This association shall be known as the American Railway Bridge & Building Association.

ARTICLE II.

OBJECT

Section 1.** The object of this association shall be the advancement of knowledge pertaining to the design, construction and maintenance of railway bridges, buildings, water service facilities, and other structures, by investigation, reports and discussions.

Section 2. The association shall neither indorse nor recommend any particular devices, trade marks or materials, nor will it be responsible for any opinions expressed in papers, reports or discussions unless the same have received the endorsement of the association in regular session.

ARTICLE III.

MEMBERSHIP

Section 1. The membership of this association shall be divided into five classes, viz: Members, life members, associate, honorary and junior members.*

Section 2.** A member shall be a person in a position above rank of gang foreman in connection with railway bridge, building and water service work. Any person desirous of becoming a member shall make application upon the form prescribed by the executive committee, setting forth his name, age, residence and practical experience. He shall furnish at least three references to whom he is personally known. Applicants may be voted into membership at any regular executive meeting or by letter ballot of the executive committee, a majority vote being necessary in either instance.

Section 3.** To be eligible for a life membership a member must have belonged to the association for at least twenty years and in general must have retired from active railway service due to age or physical disability. He shall have all the privileges of active membership, except the holding of office, and shall not be required to pay annual dues. The transfer from membership to life membership shall be made in the same manner as the election of members, as prescribed in Section 2, of this Article.

Section 4. Associates shall be responsible persons who are not eligible as members, whose pursuits or attainments qualify them to co-operate with members in the study and development of improved practices in the construction and maintenance of bridges, buildings and water facilities. They shall have all the rights of members except of voting and holding office. They shall be elected in the manner prescribed for members, in Section 2, of this Article.

Section 5. Honorary members shall be chosen from persons who have attained acknowledged eminence in some branch of engineering or railway service. Their number shall be limited to ten. Honorary members shall be proposed by not less than six active members and shall be elected by the unanimous vote of the members present at a regular meeting. They shall have all the rights of active members except that of holding office and shall be exempt from the payment of dues.

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*Amended October 16, 1941.
**Amended September 20, 1948.

Section 6. A junior member shall be a person who is a graduate of a recognized engineering school, or who has been employed for at least two years in the design, maintenance or construction of railway bridges, buildings or structures. Applicants shall be at least 21 years of age and they shall be elected in the manner prescribed for members, in Section 2 of this article. Juniors shall have all the rights of members except that of holding office. When the attainments of a Junior are such as to qualify him as a member, he may apply for promotion and the Executive Committee shall authorize such promotion when qualifications warrant the action. Unless a Junior is promoted, his membership shall cease automatically when he becomes 28 years of age.*

Section 7. Any member guilty of conduct unbecoming to a railroad officer and a member of this association, or who shall refuse to comply with the rules of this association, shall forfeit his membership on a two-thirds vote of the executive committee.

Section 8. Membership shall continue until written resignation is received by the secretary, unless member has been previously expelled, or dropped for non-payment of dues in accordance with Section 1 of Article VII.

Section 9.** Only active members shall hold office in this association, and only active and life members shall be entitled to vote in the election of officers.

ARTICLE IV.

OFFICERS

Section 1. The officers of this association shall be a president, four vice-presidents, a secretary, a treasurer and six directors who with the most recent past president shall constitute the executive committee.

Section 2. The past presidents of this association, previous to the most recent past president, who continue to be members, shall be privileged to attend all meetings of the executive committee, of which meetings they shall receive due notice, and be permitted to discuss all questions and to aid said committee by their advice and counsel; but said past presidents shall not have a right to vote, unless called upon to fill a quorum.

Section 3. Vacancies in any office shall be filled for the unexpired term by the executive committee without delay.

ARTICLE V.

EXECUTIVE COMMITTEE

Section 1.** The executive committee shall manage the affairs of the association and shall have full power to control and regulate all matters not otherwise provided for in the constitution and by-laws and shall exercise general supervision over the financial interests of the association, and make all necessary purchases and contracts required to conduct the general business of the association, but shall not have the power to render the association liable for any debt beyond the amount then in the treasury plus accounts receivable and not subject to other prior liabilities. All appropriations for special purposes must be acted upon at a regular meeting of the association.

Section 2. Meetings of the executive committee may be called by a majority of the members of the committee, providing 10 days' notice is given members by mail.

Section 3. Five members of the executive committee shall constitute a quorum for the transaction of business.

ARTICLE VI.

ELECTION OF OFFICERS AND TENURE OF OFFICE

Section 1. Except as otherwise provided, the officers shall be elected at the regular annual meeting of the association and the election shall not be postponed except by unanimous consent of the members present at said annual meeting. The election shall be by ballot, a majority of the votes cast being required for election. Any active member of the association not in arrears for dues shall be eligible for office, but the president shall not be eligible for reëlection.

*Amended October 16, 1941.

**Amended September 20, 1948.

Section 2.† The president, four vice-presidents, secretary and treasurer shall hold office for one year and the directors for two years, three directors being elected each year. All officers retain their offices until their successors are elected and installed.

Section 3.† The term of office of the secretary and the treasurer may be terminated at any time by a two-thirds vote of the executive committee. Their compensation shall be fixed by a majority vote of the executive committee.

The secretary shall also serve as secretary of the executive committee.

Section 4. The secretary and the treasurer shall be required to give bond in an amount to be fixed by the executive committee.

ARTICLE VII.

MEMBERSHIP FEE AND DUES

Section 1.† Every member upon joining this association shall pay to the secretary an entrance fee and dues as prescribed by the executive committee. No member in arrears for annual dues shall be entitled to vote at any election and any member more than one year in arrears may be stricken from the list of members at the discretion of the executive committee.

ARTICLE VIII.*

LOCAL SECTIONS

Section 1.** Upon the application of ten or more members of the association residing in the same geographical district, or having offices therein, the executive committee shall organize a local section for that district, to which all members in that district shall be eligible. Such local section shall admit to active membership only members in good standing. It shall hold not less than two meetings each year, and shall be governed by such constitution and by-laws not inconsistent with the constitution of this association as the section membership may adopt and the executive committee of the association approve.

Section 2. The parent association shall not be put under any obligation, either financial or in the matter of policy or opinion, by any local section.

ARTICLE IX.

AMENDMENTS

Section 1. This constitution may be amended at any regular meeting by a two-thirds vote of the members present, provided that notice of the proposed amendment or amendments has been sent to the members at least 30 days previous to said regular meeting.

BY-LAWS

TIME OF MEETING

1.** The regular meeting of this association shall convene annually during the month of September, the exact date to be fixed by the Executive Committee.

PLACE OF MEETING

2.** The place of holding the annual convention shall be Chicago, Ill.

3. It shall lie within the power of the executive committee to change the location or time of the meeting if it becomes apparent that it is for the best interests of the association.

QUORUM

4. At the regular meeting of the association, 15 or more members shall constitute a quorum.

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†Amended October 17, 1940.
*Article adopted 1922.
**Amended September 20, 1948.

**DUES

5. The annual dues, for the fiscal year ending August 31, and payable in advance, shall be as follows:*

Members, $5.00; Associate Members, $4.00; Junior Members, $2.50.

DUTIES OF OFFICERS

6.† The president shall have general supervision over the affairs of the association. He shall preside at all meetings of the association and of the executive committee; shall appoint all committees not otherwise provided for, and shall be ex-officio member of all committees. He shall with the secretary sign all contracts or other written obligations of the association which have been approved by the executive committee. He shall render a detailed report at least three times during the year to the members of the executive committee, showing the financial condition of the association and its activities.

At the annual meeting the president shall present a report containing a statement of the general conditions of the association.

7. The vice-presidents in order of seniority shall preside at meetings in the absence of the president and discharge his duties in case of a vacancy in his office.

8.† It shall be the duty of the secretary to keep a correct record of the proceedings of all meetings of this association, and of all accounts, between this association and its members; to collect all moneys due the association, and deposit the same in the name of the association. He shall pay all bills when properly certified and approved by the president and the treasurer, and make such reports as may be called for by the executive committee. He shall also perform such other duties as the association may require.

9.‡ The treasurer shall have charge of the funds, check all deposits as made by the secretary, sign all checks after they have been approved by the president, and invest all funds not needed for current expenses as directed by the executive committee. He shall report at each annual meeting on the condition of the finances.

NOMINATING COMMITTEE

10.♯ After each annual meeting the president shall appoint a committee consisting of five members. Two Past Presidents shall be members of this committee, one of whom shall act as Chairman. No other officers of the Association shall be appointed to this committee. This committee shall prepare a list of names of nominees for officers to be voted on at the next annual convention in accordance with ARTICLE VI of the Constitution, said list to be read at the business session of said convention. Nothing in this section shall be construed to prevent any member making further nominations.

AUDITING COMMITTEE

11.‡ Prior to each annual meeting the president shall appoint a committee of three members, not officers of the association, whose duty it shall be to examine the accounts and vouchers of the secretary and the treasurer and certify as to the correctness of their accounts.

COMMITTEE ON SUBJECTS FOR DISCUSSION

12. After each annual meeting the president shall appoint a committee whose duty it shall be to prepare a list of subjects for investigation to be submitted for approval at the next convention.

COMMITTEE ON INVESTIGATION

13. After the association has adopted the list of subjects for investigation the president for the succeeding year shall appoint the committees who shall prepare the subjects for report and discussion. He may also appoint individual members to prepare reports on special subjects, or to report on any special or particular subject.

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†Amended October 17, 1940.
‡Adopted October 17, 1940.
*Amended October 16, 1941.
**Amended September 20, 1948.
♯Amended December 4, 1950.

PUBLICATION COMMITTEE

14. After each annual meeting the executive committee shall appoint a publication committee consisting of three active members whose duty it shall be to coöperate with the secretary in the issuing of the publications of the association. The assignment of this committee shall be such that at least one member shall have served on the committee during the previous year.

ORDER OF BUSINESS

15.† Call to order by president.
Opening prayer or invocation.
President's address.
Report of secretary.
Report of treasurer.
Appointment of special committees.
Reports of standing committees and presentation of papers.
Unfinished business.
New business.
Election of officers.
Installation of officers.
Adjournment.

DECISIONS

16. The votes of a majority of the members present shall decide any questions, motion or resolution which shall be brought before the association, unless otherwise provided. Unless specifically provided herein otherwise, all discussions shall be governed by Robert's rules of order.

AMENDMENTS

17.† The By-Laws can be amended by a two-thirds vote of those present at any regularly called Executive Committee Meeting.

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†Amended September 20, 1948.

DIRECTORY OF MEMBERS

as of April 1, 1954

(Figure after each name indicates year when member joined the association)

HONORARY MEMBERS

Barnhart, E. H. (Retired) Div. Engr., B. & O., St. Petersburg, Fla. (1941)
Bechtelheimer, A. E., (Retired) Br. Engr., C. & N. W., Chicago, Ill. (1920)
Budd, Ralph, (Retired) President, C. B. & Q. Chicago, Ill. (1927)
Buford, C. H., (Retired) President, C. M. St. P. & P., Washington, D. C. (1946)
Chinn, Armstrong, President, T. R. R. A. of St. L., St. Louis, Mo. (1930)
Crites, G. S., (Retired) Div. Engr., B. & O., Baltimore, Md. (1912)
Strate, T. H., (Retired) Div. Engr., C. M. St. P. & P., Chicago, Ill. (1918)
Vandenburgh, E. C., (Retired) Ch. Engr., C. & N. W., Chicago, Ill. (1925)

ACTIVE MEMBERS

A

Adkins, H. O., Gen. Supv. B. & B., D. & R. G. W., Denver, Colo. (1953)
Ainslie, A. F., Supv. B. & B., N. P., Spokane, Wash. (1948)
Allen, G. A., Supv. B. & B., C. & O., Columbus, Ohio (1952)
Anderson, A., Spec. Asst. Engr., N. Y. C., Chicago, Ill. (1947)
Anderson, A. C., Gen. B. & B. For., D. M. & I. R., Two Harbors, Minn. (1952)
Anderson, J. L., Supv. B. & B., M. P., Osawatomie, Kan. (1931)
Andrews, J. T., Spl. Engr., B. & O., Baltimore, Md. (1947)
Armstrong, W. F., Arch'l. Engr., C. & N. W., Chicago, Ill. (1947)
Arniel, W. R., Asst. Supv. Struc., Penna., Pittsburgh, Pa. (1953)
Atkinson, T. J., Supv. of Struc., Penna., Pittsburgh, Pa. (1947)

B

Babbitt, J. H., Div. Engr., B. & O., Indianapolis, Ind. (1946)
Babcock, D. L., Supv. B. & B., C. & N. W., Norfolk, Nebr. (1953)
Baker, B., Asst. Supv. B. & B., C. & O., Saginaw, Mich. (1950)
Baker, R. C., Engr. of Struc., C. & E. I., Danville, Ill. (1940)
Barnhart, E. H., (Retired), Div. Engr. M. of W., B. & O., St. Petersburg, Fla. (1941)
Barr, H. L., Div. Engr., C. & N. W., Boone, Ia. (1938)
Barranco, S. J., Asst. Supv. Struc., Penna., Cincinnati, Ohio (1951)
Beam, Y. C., Asst. Mast. Carp., S. A. L., Americus, Ga. (1945)
Beaver, J. F., Ch. Engr. M. of W. & Struc., Sou., Charlotte, N. C. (1951)
Beck, R F., Asst. Engr., E. J. & E., Joliet, Ill. (1952)
Benjamin, H. I., Vice Chair. Sys. Com. on Ins., S. P., San Francisco, Calif. (1922)
Benson, C. E., Gen. For. B. & B., E. J. & E., Chicago, Ill. (1951)
Benson, G. W., Supt. Br., C. of Ga., Macon, Ga. (1940)
Benson, O. C., Asst. Div. Engr., B. & M., Concord, N. H. (1952)
Bergeron, J. A., Asst. B. & B. Mast., C. N., Cochrane, Ont., Can. (1949)
Beringer, M. A., Br. Inspr., I. C., Chicago, Ill. (1929)
Beynon, H. G., B. & B. Mast., C. P., Brandon, Man., Can. (1951)
Bills, R. W., Asst. Engr., M. P., Harlingen, Tex. (1953)
Bingaman, C. E., Mast. Carp., Reading, Tamaqua, Pa. (1948)
Bisbee, R. D., Div. Engr., P. & S. F., Slaton, Texas (1947)
Black, A. V., Indstrl. Engr., T. & N. O., Houston, Tex. (1953)
Blake, J. E., Jr., Asst. Supv. Struc., Penna., Harrisburg, Pa. (1953)
Block, M., Engr. of Br., I. C., Chicago, Ill. (1948)
Bober, H., B. & B. Engr., G. M. & O., Mobile, Ala. (1947)
Bodie, B. V., Ch, Engr., G. M. & O., Mobile, Ala. (1951)
Boehling, H. A., Jr., Asst. Supv. B. & B., C. & O., Richmond, Va. (1948)
Bogle, W. H., Engr. M. of W., P. T. R. R. Assn., Houston, Tex. (1951)

Boling, E. C., Supv. B. & B., N. S., Cary, N. C. (1950)
Borchert, W. C., Div. Engr., K. C. S., Shreveport, La. (1942)
Bowden, W. F., Jr., Asst. Arch., Sou., Knoxville, Tenn. (1953)
Bowman, H. A., Mast. Carp., Ft. W. & D. C., Wichita Falls, Tex. (1953)
Bowman, R. M., Gen. Fore., Penna., Johnstown, Pa. (1953)
Brandimarte, J. J., Jr., Supv. Struc., Penna., Cleveland, Ohio (1947)
Brice, W. T., B. & B. Mast., C. N., Regina, Sask., Can. (1946)
Bridjette, E. C., B. & B. Supv., S. P., Los Angeles, Calif. (1950)
Bright, B. L., Asst. to Engr. Bldgs, A. C. L., Wilmington, N. C. (1953)
Brouse, R. G., Mast. Carp., C. B. & Q., Chicago, Ill. (1951)
Brown, G. A., Gen. Fore., B. & B., A. T. & S. F., Wellington, Kan. (1953)
Brown, I. D., Insp. W. S., C. & O., Huntington, W. Va. (1952)
Brown, L. W., B. & B. Supv., C. & O., Peru, Ind. (1951)
Brown, T. W., Ch. Water Chem., I. C., Chicago, Ill. (1947)
Bruns, M. W., Br. Engr., T. R. R. A. of St. L., St. Louis, Mo. (1953)
Buckmaster, W. A., Asst. Div. Engr., B. & O. C. T., Chicago, Ill. (1951)
Budzenski, F. N., Asst. Supv. B. & B., C. & N. W., Antigo, Wis. (1938)
Bunch, A. H., Br. Inspr., St. L.-S. F., Springfield, Mo. (1951)
Bunge, W. H., Asst. Engr., M. P., Houston, Tex. (1941)
Burch, E. E., Br. Engr., C. M. St. P. & P., Chicago, Ill. (1945)
Burford, A. E., Gen. For. B. & B., I. C., Memphis, Tenn. (1947)
Burke, W. R., Supv. B. & B., I. C., Champaign, Ill. (1947)
Burkel, J. N., Draftsman, M. P., St. Louis, Mo. (1951)
Burner, P. D., Asst. Gen. Supv. Struc. & Wk. Eqpt., W. P., Oakland, Calif. (1953)
Burrows, C. D., Mast. Carp., B. & O., Wilmington, Del. (1946)
Bush, R. H., W. S. Supv., T. & N. O., Ennis, Tex. (1952)

C

Caines, W. W., Supv. B. & B., C. & O., Huntington, W. Va. (1938)
Caldwell, F. O., Mast. Carp., S. A. L., Raleigh, N. C. (1951)
Camelle, E. J., Asst. B. & B. Supv., T. & N. O. (S. P.), Houston, Tex. (1953)
Campbell, J. A., Supv. of Struc., Penna and P. R. S. L., Camden, N. J. (1951)
Carlon, J. G., Asst. Supv. B. & B., C. & O., Russell, Ky. (1947)
Carothers, M. D., Asst. Ch. Engr., G. M. & O., Bloomington, Ill. (1938)
Carter, J. W., B. & B. Supv., Virginian, Roanoke, Va. (1947)
Cary, N. M., B. & B. Supv., Sou., Greensboro, N. C. (1953)
Cash, E. E., Supv. M. W., Camas Prairie, Lewiston, Idaho (1953)
Chaffin, E. S., Supv. B. & B., N. & W., Crewe, Va. (1953)
Chamberlain, P. C., Asst. to Engr. of Struc., Erie, Cleveland, Ohio (1941)
Chaney, A. B., Asst. Ch. Engr. Sys. Mtce., M. P., St. Louis, Mo. (1947)
Chapin, S. L., Safety Supv., S. P., San Francisco, Calif. (1946)
Cheney, R. R., Ch. Carp., C. M. St. P. & P., Marion, Iowa (1953)
Christianson, H. B., Asst. Ch. Engr. Sys., C. M. St. P. & P., Chicago, Ill. (1928)
Clapper, C., Gen. Fore. B. & B., D. M. & I. R., Proctor, Minn. (1953)
Clark, K. L., Prin. Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1939)
Clise, W. E., Supv. B. & B., W. M., Frostburg, Md. (1953)
Clouette, H. M., Asst. B. &. B. Supv., N. W. P., San Rafael, Calif. (1953)
Cole, G., B. & B. Gen. For., A. T. & S. F., Burlingame, Kan. (1949)
Collette, E. L. Sr., Div. Engr., St. L.-S. F., Ft. Smith, Ark. (1949)
Collier, P. B., Supt. of Scales, M. P., St. Louis, Mo. (1938)
Collings, J. E., Ch. Carp., C. M. St. P. & P., Savanna, Ill. (1953)
Colvin, A. A., Div. Engr., C. & N. W., Norfolk, Neb. (1937)
Colvin, C. S., Asst. Engr. of Struc., M. P., Houston, Tex. (1951)
Converse, D. W., Br. Engr. A. C. & Y., Akron, Ohio (1940)
Cook, E. F., W. S. For., M. P., Little Rock, Ark. (1947)
Cooledge, V. R., Asst. Engr. Br., S. P., San Francisco, Calif. (1953)
Coombs, G. B., Gen. For. B. & B., A. T. & S. F., Fresno, Calif. (1951)
Cooper, L. L., Mast. Carp., B. & O., Indianapolis, Ind. (1952)
Corporon, F. J., Supt. W. & Struc., C. S. S. & S. B., Michigan City, Ind. (1950)
Cox, R. C., B. & B. Supv., W. P., Sacramento, Calif. (1950)
Cramer, F. H., Br. Engr., C. B. & Q., Chicago, Ill. (1927)
Crews, C. H., Supv. B. & B., I. C., Jackson, Tenn. (1947)
Croft, P. H., Asst. Engr. M. of W., I. C., Memphis, Tenn. (1947)
Crounse, W. E., B. & B. Supv., D. & H., Carbondale, Pa., (1945)
Cruikshank, A. W., Gen. Plumb. For., D. & H., Green Island, N. Y. (1950)
Cummings, C. P., Asst. Engr., M. K. T., St. Louis, Mo. (1948)
Cummings, J. W., Supv. Wk. Equip., D. & H., Albany, N. Y. (1947)

Cunningham, J. F., Ch. Br. Insptr., B. & M., Boston, Mass. (1951)
Curie, H. D., Mast. Carp., B. & O., Garrett, Ind. (1942)

D

David, J. J., Asst. Rdm., T. & N. O., Victoria, Tex. (1953)
Davis, G. B., B. & B. Supv., N. Y. C., Columbus, Ohio (1942)
Davis, G. M., Asst. Supv. B. & B., N. Y. C., Corning, Ohio (1951)
Davis, H. E., B. & B. Supv., N. Y. C. Sys., Chicago, Ill. (1940)
Davis, L. H., Gen. For. B. & B., A. T. & S. F., Amarillo, Tex. (1948)
Day, F. D., Supv. Struc., Penna., New York, N. Y. (1949)
Demmon, H. R., Asst. Gen. B. & B. Insptr., S. P., Albany, Calif. (1948)
Deno, L. J., Div. Engr., C. & N. W., Sioux City, Iowa (1947)
DeWalt, A. R., Off. Engr., Penna., Cleveland, Ohio (1949)
Dick, H. M., Supv. of Struc., Penna., Harrisburg, Pa. (1942)
Dick, M. H., Ed., Ry. Trk. & Struc., Chicago, Ill. (1937)
Dickison, C. S., Asst. Supv. B. & B., C. & O., Covington, Ky. (1953)
Dilworth, R. W., Drafts., N. Y. C., Detroit, Mich. (1953)
Dixon, N., B. & B. Mast., C. N., Montreal, Que., Can. (1949)
Dobbie, J. E., B. & B. Mast., C. P., Vancouver, B. C., Can. (1953)
Dodson, F., Asst. Supv. B. & B., C. & O., Covington, Ky. (1948)
Doerr, R. W., Asst. Supv. B. & B., C. & O., Peru, Ind. (1953)
Dove, R. E., Assoc. Ed., Ry. Trk. & Struc., Chicago, Ill. (1934)
DuBose, C. R., Res. Engr., M. P., Houston, Tex. (1948)
Duchac, J. V., Supv. B. & B., C. & N. W., Antigo, Wis. (1927)
Dunnagan, J. P., Engr. of Br., S. P., San Francisco, Calif. (1943)
Duresky, F., Jr., Supv. B. & B., C. & N. W., Huron, S. D. (1942)

E

Eargle, J. M., Asst. Mast. Carp., S. A. L., Atlanta, Ga. (1953)
Ebbens, J., Supv. B. & B., C. & W. I., Chicago, Ill. (1947)
Eble, A. E., Asst. B. & B. Supv., St. L. S. W., Tyler, Tex. (1953)
Edlund, O. F., Supv. of W. S. & Equip., B. Ry. Co. of C., Chicago, Ill. (1950)
Eichenlaub, C. M., Res. Engr., S. D. & A. E., San Diego, Calif. (1943)
Eisele, C., Asst. Engr., N. Y. C., Cleveland, Ohio (1930)
Elliott, C. E., Div. Engr., W. P., Sacramento, Calif. (1950)
Elower, L., Trav. Br. Insp., Erie, Owego, N. Y. (1948)
Enger, E. M., Supv. B. & B., C. St. P. M. & O., St. Paul, Minn. (1947)
Engman, N. V., Asst to Sec., A. R. E. A., Chicago, Ill. (1949)
Erickson, H. G., Ch. Engr., L. A. J., Los Angeles, Calif. (1953)
Erickson, O., Asst. B. & B. Supv., S. P., Sacramento, Calif. (1950)
Ester, E. J., Asst. Supv. B. & B., N. Y. C., Indianapolis, Ind. (1951)
Evans, J. R., Supv. Auto Wk Eqpt., S. P., Tucson, Ariz. (1953)
Everett, P. H., Asst. Supt. Fire Prev., I. C., Chicago, Ill. (1952)

F

Ferguson, J. D., Asst. Div. Engr., C. & O., Hinton, W. Va. (1953)
Ferry, M. H., Mast. Carp., Erie, Hornell, N. Y. (1952)
Firehammer, L. M., Supv. B. & B., Ill. Term., Springfield, Ill. (1919)
Fisher, D. H., Asst. Engr., C. M. St. P. & P., Elmwood Park, Ill. (1952)
Fisher, G. R., B. & B. Mast., C. N., Stratford, Ont., Can. (1949)
Forseth, C. E., Div. Engr., W. P., Elko, Nev. (1950)
Fouts, K., Gen. For. B. & B. & W. S., St. L-S. F. Chaffee, Mo. (1948)
Fox, R. L., Div. Engr., Southern, Alexandria, Va. (1935)
Friets, C. G., Supt. B. & B., C. & N. W., Escanaba, Mich. (1938)
Fronabarger, H. C., B. & B. Supv., T. & P., Ft. Worth, Tex. (1949)
Frost, L. M., Supv. B. & B., G. T. W., Battle Creek, Mich. (1938)
Fuhr, W. E., Div. Engr., C. M. St. P. & P., Savanna, Ill. (1948)
Fuller, T. L., Struct. Designer, T. & N. O., Houston, Tex. (1952)
Furniss, B. J., B. & B. Supv., N. Y., N. H. & H., Hartford, Conn. (1946)

G

Gabrio, C. W., Br. Engr., Virginian, Norfolk, Va. (1947)
Gannon, J. P., Div. Engr., M. St. P. & S. S. M., Stevens Point, Wis. (1947)
Garcelon, C. E., B. & B. Supt., B. & A., Houlton, Me. (1945)
Garis, L. D., Gen. Br. Insp., C. & N. W., Chicago, Ill. (1930)
Garland, E. F., Br. Supv., N. O. P. B., New Orleans, La. (1953)
Gearhart, G. W., Asst. Supv. B. & B., N. & W., Roanoke, Va. (1950)

Geyer, C. J., Vice Pres., C. & O., Huntington, W. Va. (1928)
Gilbert, L. C., Sr. Engr., E. J. & E., Joliet, Ill. (1950)
Gillespie, W. G., Mast. Carp., B. & O., Grafton, W. Va. (1946)
Gilmore, R. W., Gen. Br. Insp., B. & O., Cincinnati, Ohio (1943)
Gladwin, F. E., B. & B. Supv., N. W. P., San Rafael, Calif. (1950)
Glander, A. M., Ch. Carp., C. M. St. P. & P., Austin, Minn. (1936)
Goodin, D. W., Asst. Supv. B. & B., N. Y. C., Columbus, Ohio (1951)
Gossard, J. T., Supv. B. & B., W. M., Hagerstown, Md. (1952)
Graham, H. E., Asst. Supt. W. S., I. C., Chicago, Ill. (1946)
Graham, W. R., Asst. Supv. B. & B., C. & O., Covington, Ky. (1946)
Granger, R. W., Asst. Engr., A. C. & Y., Akron, Ohio (1953)
Green, C. C., Mast. Carp., B. & O., Wheeling, W. Va. (1953)
Greene, E. A., Asst. Supv. B. & B., B. & M., Greenfield, Mass. (1951)
Greene, H. P., Supv. Struct., Penna., Philadelphia, Pa. (1947)
Griffis, T. W., B. & B. Insp., N. Y. C. & St. L., Cayuga, Ind. (1953)
Gunderson, R. R., Br. & Struc. Engr., Sys. W. M., Baltimore, Md. (1947)
Gustafson, J. M., Br. Engr., M. & St. L., Minneapolis, Minn. (1949)

H

Hagenmaier, C. E., Asst. B. & B. Supv., S. P., Los Angeles, Calif. (1950)
Hailey, S. H., Sr. Asst. Engr., N. C. & St. L., Nashville, Tenn. (1948)
Haines, P. D., B. & B. Supv., C. & O., Saginaw, Mich. (1943)
Hamill, A., B. & B. Mast., E. & N., Victoria, B. C., Can. (1949)
Hamilton, C. W., Engr. of Design, Wabash, St. Louis, Mo. (1950)
Hampton, A. A., Asst. Supv. B. & B., M. P., DeQuincy, La. (1947)
Hancock, J. S., Br. Engr., D. T. & I. R., Dearborn, Mich. (1916)
Hanna, V. C., Ch. Engr., T. R. R. A. of St. L., St. Louis, Mo. (1953)
Harding, C. R., President, The Pullman Co., Chicago, Ill. (1924)
Harlow, H. M., Asst. Gen. Supv. B. & B., C. & O., Richmond, Va. (1939)
Harman, W. C., Supv. B. & B., S. P., San Francisco, Calif. (1911)
Harper, W. B., Supv. Trk., I. C., Vicksburg, Miss. (1953)
Harris, A. R., Engr. Br., C. & N. W., Chicago, Ill. (1940)
Hartley, L. M., Mast. Carp., S. A. L., Tampa, Fla. (1949)
Hartman, G. F., Asst. Supv. B. & B., C. & O., Columbus, Ohio (1947)
Harwood, M. S., Asst. B. & B. Supv., S. P., San Francisco, Calif. (1948)
Hawkey, W. L., Gen. Fore. B. & B., I. C., Champaign, Ill. (1953)
Hawkins, C. L., Asst. Supv. Structs., Penna., Pittsburgh, Pa. (1950)
Healy, J. J., Asst. B. & B. Supv., B. & M., Boston, Mass. (1947)
Heck, J. E., Supt. B. & B., C. & O., Ashland, Ky. (1938)
Hecker, R. L., B. & B. Supv. & W. S. Supv., C. & O., Grand Ledge, Mich. (1947)
Hedley, W. J., Asst. Ch. Engr., Wabash, St. Louis, Mo. (1950)
Hefte, A., Asst. B. & B. Supv., N. W. P., San Rafael, Calif. (1952)
Hellweg, R. D., Asst. Div. Engr., G. M. & O., Bloomington, Ill. (1947)
Hemmer, A. F., Mast. Carp., C. B. & Q., Brookfield, Mo. (1953)
Hemstad, B., Mast. Carp., G. N., Willmar, Minn. (1937)
Hickok, B. M., Supv. B. & B., N. Y. C., Cleveland, Ohio (1951)
Hildebrand, H. S., Supv. of Struct., Penna., Columbus, Ohio (1952)
Hillman, A. B., Ch. Engr., B. Ry. Co. of C., & C. & W. I., Chicago, Ill. (1942)
Hillman, W. C., Mast. Carp., Clinchfield, Erwin, Tenn. (1953)
Hiner, J. T., B. & B. Supv., Southern, Greenville, S. C. (1950)
Hodnett, E. F., Asst. Engr., M. P., Houston, Tex. (1951)
Hofstetter, P. W., Asst. B. & B. Supv., M. P., San Antonio, Tex. (1946)
Holmes, E. J., Mast. Carp., Erie, Huntington, Ind. (1952)
Hornig, F. F., Div. Engr., C. M. St. P. & P., Sioux City, Ia. (1947)
Hornung, K. E., Architect, C. M. St. P. & P., Chicago, Ill. (1949)
Hotard, A. E., Asst. Supv., B. & B., L. & N., Birmingham, Ala. (1953)
Howard, J. G., B. & B. Insp., W. P., Sacramento, Calif. (1953)
Howard, N. D., Secretary, A. R. E. A., Chicago, Ill. (1926)
Hoyt, A. C., Engr. B. & B., E. J. & E., Joliet, Ill. (1947)
Hubbard, M. J., Gen. Supv. B. & B., C. & O., Richmond, Va. (1948)
Huckaby, V. T., Steel Br. Inspt., M. K. T., Hillsboro, Tex. (1947)
Huckstep, W. A. (Retired), Gen. Bldg. Supv., M. P., St. Louis, Mo. (1941)
Huffman, W. H., Asst. Engr. M. of W., C. & N. W., Chicago, Ill. (1941)
Hull, F. G., B. & B. Supv., C. & O., Blenheim, Ont., Can. (1947)
Humphreys, R. W., Div. Engr., N. P., Missoula, Mont. (1947)
Huntsman, F. C., Asst. Engr., Wabash, St Louis, Mo. (1922)

Huston, P. F., Mast. Carp., C. & S., Denver, Colo. (1948)
Hutcheson, F. W., Supv. B. & B., C. & O., Newport News, Va. (1938)
Hutcheson, W. A., Supv. Wk. Equip., C. & O., Clifton Forge, Va. (1939)
Hutchinson, D. G., B. & B. Insp., W. P., Elko, Nev. (1950)
Hutchison, S. N., Engr. Orinoco Mining Co. R. R., New York, N. Y. (1953)
Hutto, J. E., Res. Engr., S. A. L., Savannah, Ga. (1951)

I

Inabinet, J. V., Gen. Br. Insp., S. A. L., Jacksonville, Fla. (1948)
Ingram, J. L., Struc. Drafts., T. R. R. A. of St. L., St. Louis, Mo. (1953)

J

Jackman, H. E., Mast. Carp., B. & O., Chillicothe, Ohio (1944)
Jackson, S. M., Prin. Asst. Engr., M. P., Houston, Tex. (1951)
Jackson, T. E., Gen. B. & B. Supv., S. P., San Francisco, Calif. (1942)
Jarratt, M., W. & F. Supv., S. P., Tucson, Ariz. (1950)
Jenkins, H. W., Asst. to Ch. Engr., N. Y., N. H. & H., New Haven, Conn. (1940)
Johns, D. H., Asst. Supv. of Struc., Penna., Buffalo, N. Y. (1953)
Johnson, A. C., Engr. of Design, E. J. & E., Joliet, Ill. (1944)
Johnson, B. O., Off. Engr., C. M. St. P. & P., Chicago, Ill. (1931)
Johnson, D. H., Supv. B. & B., C. M. St. P. & P., Altoona, Wis. (1940)
Johnson, E. A., Asst. Engr. Br., I. C., Chicago, Ill. (1953)
Johnson, I. K., Ch. Carp., C. M. St. P. & P., Milwaukee, Wis. (1953)
Johnston, C., Div. Engr., L. & N., Birmingham, Ala. (1953)
Johnston, G. H., Gen. For. B. & B., A. T. & S. F., Marceline, Mo. (1950)
Jones, A. C., B. & B. Supv., Southern, Birmingham, Ala. (1938)
Jones, E. B., Br. Insp., C. & O., Clifton Forge, Va. (1945)
Jones, F. Gen. For. B. & B., & W. S., St. L. - S. F., Chaffee, Mo. (1952)
Jorlett, J. A., Asst. Engr., Penna., New York, N. Y. (1946)

K

Karwich, W. P., Trav. B. & B. Insp., Erie, Wadsworth, Ohio (1948)
Kaullen, W. C., B. & B. Supv., M. P., Kansas City, Mo. (1953)
Kaylor, F. M., B. & B. Supv., G. S. & F., Valdosta, Ga. (1952)
Kelly, G. E., Asst. Wtr. & Fuel Supv., S. P., Tucson, Ariz. (1953)
Kelly, J. R., B. & B. Supv., Southern, Lexington, Ky. (1952)
Kemmerer, W. G., Asst. Engr. B. & B., Penna., Philadelphia, Pa. (1931)
Kendall, J. T., Gen. Fore. B. & B., Penna., Terre Haute, Ind. (1949)
Klingaman, C. C., Mast. Carp., Reading, Reading, Pa. (1951)
Klinger, T. R., Prin. Asst. Engr., M. St. P. & S. S. M., Minneapolis, Minn. (1951)
Knapp, P., Mast. Carp., Erie, Jersey City, N. J. (1951)
Koehler, P. L., Sup. Simp. Transp. Dept., C. & O., Huntington, W. Va. (1938)
Koenig, M. E., Div. Engr., C. St. P. M. & O., St. Paul, Minn. (1951)
Krefting, A. S., Asst. Ch. Engr., M. St. P. & S. S. M., Minneapolis, Minn. (1935)
Kruse, H. H., Ch. Carp., C. M. St. P. & P., Miles City, Mont. (1947)
Kvenberg, S. E., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1932)

L

La Bat, J. J., Supv. B. & B., M. P., Wichita, Kan. (1937)
Laird, C. W., Scale Supt., M. P., Houston, Tex. (1947)
Lamport, L. R., Ch. Engr. Mtce., C. & N. W., Chicago, Ill. (1935)
Lampson, W., Supv. B. & B., Me. Cent., Portland, Me. (1930)
Lane, H. W., Supv. B. & B., E. J. & E., Joliet, Ill. (1952)
Laurick, M. J., Gen. Fore. B. & B., Penna., Pittsburgh, Pa. (1953)
Layman, D. C., Gen. B. & B. Fore., I. C., Memphis, Tenn. (1952)
Leak, V. L., Gen. For. B. & B. & W. S., St. L. - S. F., Tulsa, Okla. (1948)
LeClaire, N. C., Supt. B. & B., T. R. R. A., of St. L., St. Louis, Mo. (1952)
*Lederer, C. C., Asst. Engr., N. Y. C. Sys., Wayne, Mich. (1949)
Lee, J. D., Asst. Engr., N. Y. C., Detroit, Mich. (1952)
Lehman, H. G., Sr. Asst. B. & B. Supv., S. P., Tucson, Ariz. (1950)
Leinweber, F. J. A., B. & B. Mast., C. N., St. Thomas, Ont., Can. (1947)
Lieser, H. J., Trk. Supv., B. Ry. Co. of C., Chicago, Ill. (1948)
Lingle, T. N., Gen. For. B. & B., I. C., Carbondale, Ill. (1951)
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Loper, L. E., Asst. Mast. Carp., Erie, Hornell, N. Y. (1951)
Lorber, R. J., Supv. B. & B., P. & P. U., Peoria, Ill. (1948)
Lord, H. T., B. & B. Mast., C. P., Kenora, Ont., Can. (1940)
Lorence, H. B., Fire Prot. Engr., C. R. & I., (Gibson,) Hammond, Ind. (1950)
Lowry, J. M., Asst. to Ch. Engr., St. L. S. W., Tyler, Tex. (1950)
Lucas, H. F., Detailer, C. M. St. P. & P., Chicago, Ill. (1952)
Luce, W. L., Mast. Carp., Erie, Youngstown, Ohio (1952)
Luck, R. P., Draftsman, C. & N. W., Chicago, Ill. (1920)
Lucy, J. M., B. & B. Supv., D. & H., Plattsburgh, N. Y. (1953)
Lund, C. V., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1947)
Lyman, V. W., Supv. B. & B., C. V., St. Albans, Vt. (1953)
Lyon, L. E., Div. Engr., S. P., El Paso, Tex. (1947)

Mc

*McCallum, S. L., Arch. Designer, M. C., Detroit, Mich. (1952)
McCauley, M. L., Asst. Engr. of Struct., N. Y. C., Elmhurst, Ill. (1950)
McDonald, J. W., Gen. For. B. & B. & W. S., St. L. - S. F., Springfield, Mo. (1947)
McElreath, C. S., B. & B. Supv., Southern, Chattanooga, Tenn. (1951)
McEwen, R. G., B. & B. Supv., Mo. Ill., Ste. Genevieve, Mo. (1952)
McGee, M. A., Div. Engr., L. & N., Ravenna, Ky. (1953)
McGrew, B. H., Supv. B. & B., St. L. S. W. of T., Tyler, Tex. (1951)
McGrew, F. O., Ch. Carp, C. M. St. P. & P., Terre Haute, Ind. (1948)
McKee, E. R., Asst. Div. Engr., B. & O., Washington, Ind. (1947)
McKibben, D. H., Asst. Supv. of Struct., Penna., Cape Charles, Va. (1951)
McLeod, C. A., B. & B. Supv., A. T. & N., York, Ala. (1953)
McMillen, J. W., Asst. Engr., T. R. R. A. of St. L., St. Louis, Mo. (1953)
McNally, P. F., B. & B. Supv., S. P., Ogden, Utah (1948)

M

MacDonald, J. J., Asst. Supv. B. & B., B. & M., Boston, Mass. (1951)
Madson, H. C., Designer, C. & N. W., Chicago, Ill. (1940)
Malmberg, C. R., Asst. Supv. B. & B., C. & N. W., Milwaukee, Wis. (1948)
Manley, B. F., Supv. B. & B., P. E., Los Angeles, Calif. (1943)
Manning, D. A., Supv. B. & B., C. & N. W., Chicago, Ill. (1939)
Manning, W. K., Supv. of Br., Erie, Port Jervis, N. Y. (1948)
Marshall, R. B., Asst. Engr., C. & O., Richmond, Va. (1949)
Martens, W. F., Gen. For. B. & B., A. T. & S. F., San Bernardino, Calif. (1924)
Martin, G. E., Supt. W. S., I. C., Chicago, Ill. (1942)
Martin, J. W., Asst. Mast. Carp., S. A. L., Jacksonville, Fla. (1953)
Martin, S. L. Asst. B. & B. Supv., T. & N. O., LaFayette, La. (1951)
Martin, T. J., Gen. Mast. Carp., G. N., Seattle, Wash. (1940)
Mason, S. K., Ch. Engr., T. M., Laredo, Tex. (1950)
Mateer, W. G., Mgr. of Pur. & Stores, E. J. & E., Chicago, Ill. (1944)
Mathis, R. C., Br. Insp., I. C., Memphis, Tenn. (1947)
Matthews, H. A., Gen. For. B. & B. & W. S., St. L. - S. F., Amory, Miss. (1949)
Matthews, W. L., Sr. Asst. B. & B. Supv., S. P., Tucson, Ariz. (1953)
May, L. E., B. & B. For., A. T. & S. F., Fresno, Calif. (1948)
Mayfield, L. Res. Engr., M. P., Houston, Tex. (1944)
Mays, J. W. N. Jr., Supv. Struct., Penna., Pittsburgh, Pa. (1947)
Meeks, W. R., B. & B. Supv., M. P., Falls City, Neb. (1942)
Meredith, W. E., Supv. Struct., Penna., Indianapolis, Ind. (1950)
Merrill, B. W., Supv. B. & B., N. Y. C. & St. L., Conneaut, Ohio (1936)
Meserve, E. S., Asst. Supv. B. & B., B. & M., Dover, N. H. (1949)
Meyers, B. R., Ch. Engr., C. & N. W., Chicago, Ill. (1930)
Midkiff, R. B., Ch. Engr., M. W. & S., Sou., Knoxville, Tenn. (1953)
Miesenhelder, P. D., Concrete Engr. Research Staff - A.A.R., Chicago, Ill. (1952)
Miller, R. H., Asst. Engr., B. & A., Houlton, Me. (1953)
Miller, R. S., Bldg. Supt., C. R. I. & P., Chicago, Ill. (1949)
Milne, A. P., Supv. B. & B., N. Y. C. & St. L., Frankfort, Ind. (1953)
Mitchell, D. N., Asst. Supv. B. & B., C. & O., Newport News, Va. (1948)
Montague, C. F., Asst. Engr., Penna., Philadelphia, Pa. (1953)
Moore, A. J., Br. Insp., M. P., Eunice, La. (1950)
Moore, H. S., B. & B. Mast., C. P., Revelstoke, B. C., Can. (1953)
Moore, I. A., Ch. Engr., C. & E. I., Danville, Ill. (1937)

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Moreland, H. B., B. & B. Supv., Southern, Wilton, Ala. (1951)
Morgan, J. H., Engr. M. of W., F. E. C., St. Augustine, Fla. (1948)
Morgan, L. R., Fire Prot. Engr., N. Y. C., Detroit, Mich. (1937)
Morrison, R. H., Ch. Engr., B. & A., Houlton, Me. (1941)
Moser, C. A., B. & B. Supv., S. N., Sacramento, Calif. (1951)
Mottier, C. H., Vice Pres. & Ch. Engr., I. C., Chicago, Ill. (1942)
Mouhot, P. T., B. & B. Supv., T. & N. O., Lafayette, La. (1952)
Myers, R. L., Supv. W. S., I. C., Clarksdale, Miss. (1950)

N

Neal, G. W., Supt., Chattahoochee Valley, West Point, Ga. (1948)
Nelson, R. A., Engr. of Bldgs., C. G. W., Chicago, Ill. (1948)
Nicely, O. P., Asst. Supv. B. & B., C. & O., Clifton Forge, Va. (1950)
Nichols, J. C., Br. Engr., L. & N., Louisville, Ky. (1953)
Norris, H. Asst. Supv. B. & B., F. E. C., Miami, Fla. (1948)
Norris, J. M. W., B. & B. Supv., D. & H., Oneonta, N. Y. (1952)
Norton, R. L., Mast. Carp., S. A. L., Savannah, Ga. (1951)
Nuckols, L. T., Ch. Engr., C. & O., Richmond, Va. (1951)

O

O'Brien, J. B., Asst. Supv. B. & B., C. & O., Richmond, Va. (1953)
Oest, W. C., Prin. Asst. Engr., Ft. W. & D., Ft. Worth, Tex. (1947)
Olson, O. D., B. & B. Supv., C. & N. W., Chicago, Ill. (1953)
Olson, V. E., B. & B. Supv., M. St. P. & S. S. M., Stevens Point, Wis. (1948)
Ornburn, B. J., Asst. Ch. Engr. Struct., C. M. St. P. & P., Chicago, Ill. (1948)
Ovardits, K., Asst. Engr., N. Y. C., Chicago, Ill. (1953)

P

Pahl, W. H., Jr., Asst. Supv. Strucs., Penna., Indianapolis, Ind. (1950)
Park, E., Jr., Draftsman, M. P., Houston, Tex. (1948)
Parrish, E. L., Div. Engr., I. C., Vicksburg, Miss. (1947)
Paulson, R. E., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1945)
Pearson, A. H., Mast. Carp., C. B. & Q., St. Joseph, Mo. (1952)
Peden, J. S., W. S. Supv., T. & P., Big Spring, Tex. (1953)
Pederson, W. E., B. & B. Supv., M. St. P. & S. S. M., Superior, Wis. (1950)
Peek, J. M., B. & B. Supv., Southern, Greenville, S. C. (1951)
Penhallegon, J. R., Asst. Supv. B. & B., C. & N. W., Chicago, Ill. (1940)
Perrier, J. L., Div. Engr., C. & N. W., Chicago, Ill. (1953)
Perrine, D. E., Asst. Ch. Engr., C. & W. I., Belt Ry. Co. of Chgo., Chicago, Ill. (1953)
Perry, C., Asst. Supv. B. & B., C. & O., Ashland, Ky. (1950)
Peterson, H. R., Ch. Engr., N. P., St. Paul, Minn. (1953)
Peterson, J. C., Sr. Asst. B. & B. Supv., S. P., Sacramento, Calif. (1950)
Peterson, J. E., Off. Engr., C. & W. I. & B. Ry. Co. of C., Chicago, Ill. (1952)
Peterson, N. E., Ch. Engr., C. & I. M., Springfield, Ill. (1938)
Petteys, W. F., Div. Engr., Erie, Hornell, N. Y. (1948)
Pfeiffer, A., Asst. B. & B. Supv., S. P., Sacramento, Calif. (1939)
Phelps, C. E., B. & B. Supvr., Georgia R. R., Camak, Ga. (1949)
Philips, R. J., Asst. Supv. B. & B., N. Y., N. H. & H., Edgewood, R. I. (1951)
Phillips, B. C., Mast. Carp., C. B. & Q., Alliance, Neb. (1947)
Phillips, E. L., Mast. Carp., C. B. & Q., Casper, Wyo. (1953)
Piepmeier, A. L., Br. Engr., C. G. W., Oelwein, Ia. (1953)
Pierce, G. A., Mast. Carp., B. & O., Halethorpe, Md. (1953)
Pinard, T. W., Ch. Engr., L. I., Jamaica, N. Y. (1920)
Plechner, E. J., B. & B. Insp., Reading, Philadelphia, Pa. (1950)
Podas, N. F., Ch. Engr., St. P. U. D. Co. & M. T. Ry. Co., St. Paul, Minn. (1937)
Pound, E. R., Mast. Carp., B. & O., Newark, Ohio (1952)
Preston, C. W., Engr. Prot. Coatings, B. & O,. Baltimore, Md. (1950)
Price, A. C., B. & B. Master, C. P., London, Ont., Can. (1953)
Priest, G. H., Gen. For. B. & B., C. N., Belleville, Ont., Can. (1948)
Prude, G. F., Supv. B. & B., T. & N. O., Houston, Tex. (1951)
Pryor, W. H., Gen. For. B. & B. & W. S., St. L. - S. F., Memphis, Tenn. (1946)

R

Radford, W. C., Div. Engr., Southern, Richmond, Va. (1951)
Raessler, V. D., Supv. B. & B., I. C., Memphis, Tenn. (1951)
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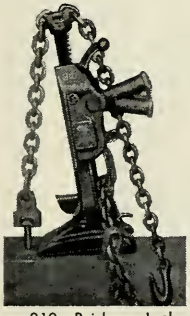

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Rasmussen, L. B., Asst. Supv. Struc., Penna., Newark, N. J. (1953)
Raver, H. E., Engr. of Struc., L. I., Jamaica, N. Y. (1952)
Reece, A. N., Asst. to the Pres., K. C. S., Kansas City, Mo. (1922)
Reed, F. A., Supv. B. & B., I. C., Clinton, Ill. (1947)
Reese, C. M., Gen. Fore. B. & B., G. C. & S. F., Temple, Tex. (1953)
Rice, E. D., B. & B. Supv., C. & E. I., Danville, Ill. (1949)
Richards, W. T., Engr. Mtce. W. & S., W. P., San Francisco, Calif. (1950)
Richardson, H. B., B. & B. Supv., B. & M., Dover, N. H. (1948)
Roberts, H. L., Br. Insp., C. & O., Royal Oak, Mich. (1953)
Robertson, J. H., Asst. Engr., M. P., Houston, Tex. (1953)
Robinson, G. E., Engr. Struct., N. Y. C. Sys., Chicago, Ill. (1948)
Robinson, N. R., B. & B. Supv., S. P., Sacramento, Calif. (1934)
Rode, L. A., Gen. Br. Insp., Erie, Newark, N. J. (1948)
Rourke, J. E., Stud. Supv., B. & M., Dover, N. H. (1952)
Routenberg, H. W. (Retired), Mast. Carp., B. & O., Baltimore, Md. (1946)
Russell, C. E., Supv. W. S., I. C., Chicago, Ill. (1953)
Ryan, G. M., B. & B. Supv., N. Y., N. H., & H., Boston, Mass. (1947)

S

Safely, J. R., Sr. Asst. B. & B., Supv., S. P., San Mateo, Calif. (1945)
Salmon, J. M., Jr., Ch. Engr., Clinchfield, Erwin, Tenn. (1938)
Sathre, C. O., B. & B. Supv., C. & N. W., Madison, Wis. (1950)
Saunders, H. M., Supv. B. & B., C. & O., Richmond, Va. (1953)
Saunders, T. D., Ch. Engr., O. N., North Bay, Ont., Can. (1930)
Saurer, D. E., Asst. Supv. Struct., Penna., Logansport, Ind. (1951)
Sawyer, J. H., Jr., Asst Ch. Engr., C. G. W., Oelwein, Ia. (1951)
Scheumack, J. F., Br. Engr. & Insp., T. & N. O., Houston, Tex. (1950)
Schlaf, E. R., Asst. Supt. W. S., I. C., Chicago, Ill. (1947)
Schmidl, R. M., Ry. Track & Strucs., New York, N. Y. (1952)
Schneider, J. C., B. & B. Supv., T. & N. O., Victoria, Tex. (1950)
Schroeder, A. W., Supt., C. & E. I., Danville, Ill. (1949)
Scites, P. E., Supv. B. & B., C. & O., Huntington, W. Va. (1950)
Scroggin, D. R., Jr., Engr., C. S. S. & S. B., Michigan City, Mich. (1953)
Seals, R. K., Trk. Supv., Southern, Greensboro, N. C. (1951)
Seley, L. L., Mast. Carp., C. B. & Q., Hannibal, Mo. (1953)
Seltzer, H. A., B. & B. Supv., N. P., Missoula, Mont. (1953)
Selvidge, B. F., Asst. B. & B. Supv., M. P., Van Buren, Ark. (1951)
Shaefer, L. A., Supv. W. S., M. P., Osawatomie, Kan. (1948)
Sharkey, J. J. (Retired), Gen. For. B. & B., Penna., Bradley Beach, N. J. (1951)
Shepley, S. H., Ch. Engr., E. J. & E., Joliet, Ill. (1945)
Shirey, L. L., Br. Engr., C. & O., Richmond, Va. (1953)
Shobert, F., Sys. Steel Constr. For., S. P., Oakland, Calif. (1918)
Short, J. M., Gen. W. S. Insp., T. & P., Dallas, Tex. (1950)
Short, W. L., Br. Insp., M. P., St. Louis, Mo. (1951)
Siegfried, F. A., For. Carp., Reading, Reading, Pa. (1947)
Simon, A. H., Engr. of Bldgs., C. B. & Q., Chicago, Ill. (1952)
Simpson, P. X., Supv. B. & B., N. P., Tacoma, Wash. (1953)
Sims, C. C., Asst. Supv. B. & B., C. & O., Hinton, W. Va. (1947)
Sinclair, C. H., Asst. Supv. B. & B., C. & N. W., Tracy, Minn. (1953)
Singer, E. W., Supv. B. & B., N. Y., C. & St. L., Ft. Wayne, Ind. (1923)
Sirel, A. A., Asst. Res. Engr. of Struc., A. A. R., Chicago, Ill. (1940)
Skinner, H. E., Supv. Scales & Wk. Equip., E. J. & E., Joliet, Ill. (1944)
Slagle, G. P., Ch. Carp., C. M. St. P. & P., Milwaukee, Wis. (1948)
Smith, C. A., Supv. B. & B., C. R. & I. and I. H. B., Hammond, Ind. (1946)
Smith, E. L., B. & B. Supv., Southern, Hattiesburg, Miss. (1952)
Smith, H. E., Engr. M. of W., G. H. & H., Galveston, Tex. (1941)
Smith, J., B. & B. Supv., S. P., Sacramento, Calif. (1943)
Smith, J. G., Asst. Supv., B. & B., C. & O., Clifton Forge, Va. (1953)
Smith, L. C. (Retired), Div. Engr., C. & N. W., Eagle Grove, Ia. (1942)
Smith, L. L., Asst. B. & B. Supv., S. P., Dunsmuir, Calif. (1948)
Smith, N. E., Asst. Engr., C. M. St. P. & P., Minneapolis, Minn. (1951)
Snyder, E. F., Asst. to Ch. Engr., I. C., Chicago, Ill. (1948)
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Stevens, C. M., B. & B. Supv., S. P., Portland, Ore. (1950)
Stewart, F. J. (Retired), Ch. Engr., Port Everglades, Belt Line, Hollywood, Fla. (1944)
Stinebaugh, J. H., Supv. W. S., I. C., Carbondale, Ill. (1951)
Stone, V. E., Fire Insp., N. Y. C., Elkhart, Ind. (1951)
Stoneman, W. Jr., Sr. Asst. B. & B. Supv., S. P., El Cerrito, Calif. (1949)
Strouss, J. A., Asst. Supv. B. & B., S. P., Sacramento, Calif. (1934)
Stutzman, J. W., For. Carp., Reading, Reading, Pa. (1947)
Sumner, J., W. S. For., St. L. - S. F., Springfield, Mo. (1948)
Swanson, M., Insp. B. & B., D. T. & I., Dearborn, Mich. (1953)
Sweet, W. A., Gen. For. B. & B., A. T. & S. F., Newton, Kan. (1928)
Switzer, G., Asst. Div. Engr., W. P., Sacramento, Calif. (1949)
Switzer, R. E., Gen. For. B. & B. & W. S., G. C. & St. F., Galveston, Tex. (1952)

T

Taggart, C. R., Supv. B. & B., N. Y. C., Indianapolis, Ind. (1935)
Tardy, F. E., Asst. Div. Engr., S. P., Tucson, Ariz. (1953)
Taylor, F. H., Asst. Engr. M. of W. Dept., F. E. C., St. Augustine, Fla. (1951)
Taylor, W. L., B. & B. Supv., Southern, Jasper, Ala. (1950)
Templin, R. S., For. Carp., Reading, St. Clair, Pa. (1947)
Tetrault, L. J., B. & B. For., N. Y., N. H. & H., Worcester, Mass. (1936)
Thelander, P. V., Asst. Ch. Engr., C. & N. W., Chicago, Ill. (1939)
Todd, D. C., Asst. Engr., Penna., Pittsburgh, Pa. (1942)
Todd, J. N., Supt. Scales & Wk. Eqpt., Sou., Washington, D. C. (1953)
Tourtellotte, E. B., Supv. B. & B., B. & M., Greenfield, Mass. (1947)
Trulove, J. D., Sr. Asst. B. & B. Supv., S. P., Ogden, Utah (1945)
Tucker, N. R., Asst. Div. Engr., T. & N. O., Austin, Tex. (1939)
Tunison, H. C., Asst. Engr. M. of W., L. & N. E., Bethlehem, Pa. (1946)
Tupper, A. E., B. & B. For., S. P., Stockton, Calif. (1942)
Turner, E. F., For. Steel Const., M. K. T. & M. K. T. of T., Denison, Tex. (1950)

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Van Ness, R. A., Br. Engr. Sys., A. T. & S. F., Chicago, Ill. (1949)
Varker, J. L., Div. Engr., D. & H., Carbondale, Pa. (1936)
von Sprecken, R. E., Trk. Supv., Southern, Winston Salem, N. C. (1951)
von Sprecken, T. M., Asst. to Ch. Engr., Southern, Washington, D. C. (1938)

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Wager, R. O., Ch. Fire Prot. Engr., N. Y. C., New York, N. Y. (1951)
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Walker, G. P., Supv. B. & B., M. P., Monroe, La. (1929)
Walker, S. C., Supv. of Strucs., Penna., Chicago, Ill. (1952)
Wall, E. G., Div. Engr., G. M. & O., Bloomington, Ill. (1942)
Wallace, C. E., Gen. For. B. & B. & W. S., St. L. - S. F., Ft. Smith, Ark. (1948)
Wallace, J. E., Gen. Fore. (Engr.), M. P., Chester, Ill. (1950)
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Ward, W. G., Asst. Supv. B. & B., C. & N. W., West Chicago, Ill. (1952)
Warfield, H., Jr., Insp., M. of W., Penna., New Brunswick, N. J. (1953)
Warfield, W. B., Supv. Struct., Penna., Swissvale, Pa. (1951)
Warner, B. I., Asst. Supv. B. & B., Me. Cent., Portland Me. (1952)
Warrenfells, J. F., Asst. Div. Engr., S. A. L., Raleigh, N. C. (1946)
Watson, L. W., Dist. Br. Insp., B. & O., Pittsburgh, Pa. (1944)
Weatherly, H. E., Asst. Div. Engr., T. & N. O., El Paso, Tex. (1950)
Weaver, W. R., Asst. Supt., P. & S., Kittanning, Pa. (1951)
Webber, G. R., Ch. Carp., C. M. St. P. & P., Spokane, Wash. (1948)
Welch, J. W., Supv. B. & B., F. E. C., St. Augustine, Fla. (1943)
Wells, W. M., Asst. Div. Engr., B. & O., Washington, Ind. (1946)
Westergren, R. A., Asst. Div. Engr., Penna., Harrisburg, Pa. (1947)
White, L. H., Supv. B. & B., I. C., Carbondale, Ill. (1946)
White, S., Gen. B. & B. Supv., S. P., San Francisco, Calif. (1942)
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Wilson, H. M., Asst. Supv. Struc., Penna., Columbus, Ohio (1953)
Wilson, R. P., Supv. B. & B., C. & O., Hinton, W. Va. (1948)
Wilson, W. E., Supv. B. & B., I. R. of C. A., San Salvador, C. A. (1950)
Winkelhaus, L. C., Arch. Engr., C. & N. W., Chicago, Ill. (1934)
Wintoniak, S. G., Supv. of Struc., Penna., Altoona, Pa. (1953)
Wistrich, H. A., Asst. Ch. Engr., L. V., Bethlehem, Pa. (1938)
Witherspoon, J. P., Mast. Carp., S. A. L., Savannah, Ga. (1948)
Woodrow, R. F., Asst. Supv. B. & B., Portland Term., Portland, Me. (1951)
Woodward, J. D., Asst.Supv. Strucs., Penna., Pittsburgh, Pa. (1952)
Woolford, F. R., Ch. Engr., W. P., San Francisco, Calif. (1950)
Wray, H. O., Sec. & Ch. Engr., T. C. Term., Texas City, Tex. (1939)
Wrights, H., Supv. B. & B., M. P., Little Rock, Ark. (1929)

Y

Yaw, D. M., Mast. Carp., Erie, Buffalo, N. Y. (1951)
Yewell, J. E., Ch. Engr., B. & L. E., Greenville, Pa. (1941)

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Zapfe, E. J., Asst. Ch. Engr. & Supt. B. & B., G. B. & W., Green Bay, Wis. (1952)
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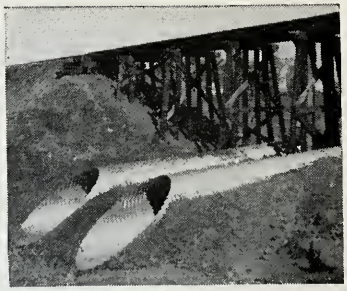

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B

Batey, W. A., (Ret.), Const. Engr., U. P., 4303 South St., Lincoln Neb. 1918
Bost, M. A., (Ret.), Asst. Engr., C. M. St. P. & P., Mason City, Iowa 1935

C

Canty, J. P., (Ret.), Asst. to Engr. M. of W., B. & M., 40 Prospect St., Melrose, Mass. . . 1901
Christiansen, L., (Ret.), Fore. B. & B., C. M. St. P. & P., 255 So. 11th St., Marion, Ia. . . 1928
Church, H. M., (Ret.), Gen. Supvr. B. & B., C. & O., 509 No. Blvd., Richmond, Va. . . . 1939
Clark, W. A., (Ret.), Off. Engr., D. M. & I. R., 2718 E. 5th St., Duluth 5, Minn. 1908
Corey, S. T., (Ret.), Off. Engr. & Engr. of Br., C. R. I. & P., 7250 Harvard Ave.,
Chicago 21, Ill. 1913
Cota, G. M., (Ret.), Ch. Clk. Engr. Dept., C. of V., Box 114, St. Albans, Vt. 1913

D

Decker, H. H., (Ret.), Res. Engr., C. & N. W., 2915 Ingersoll Ave., Des Moines, Ia. . . . 1939

E

Elwell, H. A., (Ret.), Supt. B. & B., C. G. W., 1735 Marshall Ave., St. Paul, Minn. . . . 1911
Engman, V. E., (Ret.), Ch. Carp., C. M. St. P. & P., 3429 - 17th Ave., So.,
Minneapolis 7, Minn. 1920

F

Flynn, M. J., (Ret.), Supvr. B. & B., C. & N. W., 2445 Coyle Ave., Chicago 45, Ill. 1905

G

Gehr, B. F., (Ret.), Mast. Carp., Penna., 400 So. 14th St., Richmond, Ind. 1908
Gentis, I., (Ret.), Fore. B. & B., S. P., 2003 West St., Oakland, Calif. 1912
Gerst, H. A., (Ret.), Asst. Engr., G. N., 748 Aldine St., St. Paul 4, Minn. 1917
Gillette, J. E., (Ret.), Carp. Fore., C. M. St. P. & P., c/o Carp. Fore., C. M. St. P. & P.
Mazomanie, Wis. 1923
Gillis, A. D., (Ret.), B. & B. Supvr., N. Y. N. H. & H., c/o B. & B. Supvr.,
N. Y., N. H. & H., Providence, R. I. 1923
Gunderson, E., (Ret.), Supt. B. & B., C. St. P. M. & O., Altoona, Wis. 1927
Guppy, B. W., (Ret.), Engr. Strucs., B. & M., 52 Stratford Rd., Melrose, Mass. 1914

H

Hand, G. W., (Ret.), Asst. to Pres., C. & N. W., 412 Courtland Ave., Park Ridge, Ill. . . 1909
Hartwell, J. R., (Ret.), Supvr. B. & B., C. & N. W., c/o Supvr. B. & B., C. & N. W.,
Pierre, S. D. 1918
Heiszenbuttel, H., (Ret.), B. & B. Supvr., C. & N. W., 808 So. 3rd St., Norfolk, Neb. . . 1917
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Horning, H. A., (Ret.), Asst. Supt. Br., M. C., 1106 Francis St., Jackson, Mich. 1902
Howay, B. J., (Ret.), Supvr. B. & B., C. & O., 403 No. Bridge, Grand Ledge, Mich. 1919

J

Johnson, M., (Ret.), Prin. Asst. Engr., I. C., c/o Casa de Fresa., Hammond, La. 1915
Jones, B. L., (Ret.), Tr. Mast., R. F. & P., c/o Tr. Mast., R. F. & P., Richmond, Va. 1937

K

Kimball, L. P., (Ret.), Engr. Bldgs., B. & O., 5910 S. W. 50th St., Miami 34, Fla. 1921
Knetzger, E. J., (Ret.), Fore. B. B., S. P., 3140 E. 27th St., Oakland 1, Calif. 1926
Koch, H. L., (Ret.), Supvr. B. & B., N. Y. C. & St. L., 637 Main St., Conneaut, Ohio 1922

L

Lacher, W. S., (Ret.), Secretary, A. R. E. A., 407 E. Fuller Rd., Hinsdale, Ill. 1922
Lacy, W. J., (Ret.), Supvr. B. & B., M. P., 4370 Swan St., St. Louis, Mo. 1911
Landstrom, C. A., (Ret.), Supvr. B. & B., C. B. & Q., 1311 S. 3rd St., Burlington, Ia. 1928
Larsen, H. C., (Ret.), Str. Iron Fore., C. St. P. M. & O., 1084 Sims Ave., St. Paul 6, Minn. 1928
Lincoln, S., (Ret.), Gen. Fore. B. & B., G. C. & S. F., 1903 Harrison Ave., Beaumont, Tex. 1927

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McCabe, E. M., (Ret.), Supvr. B. & B., B. & A., Rte. 44, Narrangansett Ave., Pittsfield, Mass. 1915
McKay, A. G., (Ret.), Supvr. B. & B., N. Y., N. H. & H., 11 Pine Island Road, Jupiter Pt. Groton, Conn. 1915
McMahon, T. D., (Ret.), Arch., G. N., 223 Lake Avenue, White Bear Lake 10, Minn. 1918
McNaughton, H. C., (Ret.), Supvr. B. & B., B. & M., c/o Supvr. B. & B., B. & M., Greenfield, Mass. 1915

M

Masters, F. H., (Ret.), Spec. Engr., E. J. & E., 907 Glenwood Ave., Joliet, Ill. 1920
Mead, E. L., (Ret.), Div. Engr., C. & N. W., 536 N. E. 69th St., Miami, Fla. 1923
Mellgren, J., (Ret.), Fore. W. S., C. & N. W., 523 N. Cadwell Ave., Eagle Grove, Ia. 1913
Merwin, P. B., (Ret.), Asst. Engr., C. & N. W., Rte. 2, Box 565, Washougal, Wash. 1929
Miller, C. E., (Ret.), Asst. Engr. M. of W., C. & N. W., 251 Woodland Rd., Highland Pk., Ill. 1916

N

Nies, A. B. (Ret.), Arch., N.Y.C.System, 408 Third St., Jackson, Mich. 1915

O

O'Brien, W. J., (Ret.), Dist. Carp., C.M.St.P. & P., Juneau County, Necedah, Wis. 1919

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Parker, W. V., (Ret.), Gen.Fore.B & B., St.L.S.W., 683 Berclair Rd., Memphis 12, Tenn. 1911
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Rehmert, D. L. (Ret.), Mast. Carp., Penna., 376 Chitteden Ave., Columbus, Ohio 1918
Richards, C. A. J., (Ret.), Asst. Supvr. Strucs., Penna., 422 Gladstone Ave., S.E. Grand Rapids, Mich. 1924
Rights, H. T., (Ret.), Asst. Br. Engr., L. V., 1015 Raymond Ave., Bethlehem, Pa. 1927
Rintoul, D. T., (Ret.), Gen. Br. Insp., S. P., San Francisco, Calif. 1910
Roof, W. R., (Ret.), Br. Engr., C. G. W., 7728 So. Yates Ave., Chicago 49, Ill. 1927
Rowland, O. F., (Ret.), Asst. Engr., D. & H., c/o Berkshire Industrial Farm, Canaan, N. Y. 1923

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Scheetz, F. B., (Ret.), Asst. Engr., M. P., 3930 Connecticut Ave. N.W., Washington, D. C. 1905
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V

Vance, W. H., (Ret.), Asst. Engr. M. of W., M.P., 6347 Alamo Ave., Clayton 5, Mo. .. 1910
Von Schrenk, H., (Ret.), Cons. Tbr. Engr., M. P., 4030 Chouteau Bldg., St. Louis, Mo. .. 1916

W

Walden, W. H., (Ret.), Rdm., Southern, 1012 Porter St., Richmond 24, Va. 1920
White, F. W., (Ret.), Supvr., B.&B., L.V., 409 So. Wilbur Ave., Sayre, Pa. 1915
White, W. E., (Ret.), Gen. Fore., A.T.&S.F., 706 W. 6th St., Chanute, Kan. 1920
Womeldorf, C. F., (Ret.), Div. Engr., C. & N.W., 111 No. 12th St., Norfolk, Nebr. .. 1917
Wright, C. W., (Ret.), Mast. Carp., L.I., 67 Nassau Pkwy., Oceanside, N. Y. 1908
Wuerth, H., (Ret.), Div. Engr. C.M.St.P.&P., Savanna, Ill. 1919

Z

Zinsmeister, E. C., (Ret.), Mast. Carp., B. & O., 303 - 12th Ave. No., St. Petersburg, Fla. 1905

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A

Arnold, W. P., Vice Pres. & Gen. Mgr., (Wood Preserving Div.), Koppers Co. Inc. Pittsburgh 19, Pa. 1946

B

Bailey, G. H., Supt. R. R. Div., Morrison-Knudsen Co., 1718 No. 15th St., Boise, Ida. .. 1946
Baker, D. L., Vice Pres. & Treas., Baker & Hickey Co., P.O. Box 5008, Tri Village Sta. Columbus 12, Ohio 1946
Bauman, K. F., Vice Pres. - Sls., Warren Tool Corp., Warren, Ohio 1952
Betts, G. R., Div. Sls. Mgr., Armco Drainage & Metal Prod. Inc., 3202 W. Sample St., South Bend 21, Ind. 1946
Bishop, D. B., Dist. Mgr., Dearborn Chemical Co., 1514 Farmers Bank Bldg., Pittsburgh 22, Pa. 1946
Bolton, J. D., President, John D. Bolton & Co., Gunite Contractor, 910 Custer Ave., Evanston, Ill. 1946
Borcherding, C. H., Dist. Mgr., The Master Bldrs. Co., 2125 Maryland Ave., Baltimore, Md. 1947
Boulton, C. R., R. R. Contractor, 10 E. Town St., Columbus 15, Ohio 1946
Brennon, L. D., M. of W. Repr., Air Reduction Sls. Co., 620 King Dr., Pine Lake Ga. .. 1950
Bryant, C. E. Jr., Johns-Manville Sls. Corp., 22 E. 40th St., New York, N. Y. 1951
Burkey, J. R., Const. Engr., The Union Metal Mfg. Co., 2421 Plymouth Ave., Columbus, Ohio 1942
Burpee, C. M., Secy.-Mgr. Service Bureau, American Wood Preservers Assn., 111 W. Washington St., Chicago, Ill. 1930
Buskirk, G. C., Repr., Pacific Coast Borax Co., 5012 Cedar Ave., So. Minneapolis 17, Minn. 1949

C

Canning, J. F., Pres., Southwestern Petroleum Co., Inc., P. O. Box 789, Ft. Worth, Tex. 1949
Clapp, K. J., Asst. Sls. Mgr., Homelite Corp., Port Chester, N. Y. 1946
Clark, H., Jr., Mgr. R. R. Sls., Armco Drainage & Metal Products, Inc., 310 S. Michigan Ave., Chicago, Ill. 1953
Clarke, R., Res. Mgr., Massey Concrete Products Co., 111 W. Washington St. Chicago 2, Ill. 1948
Claybaugh, H. S., Div. Engr., Armco Drainage & Metal Prod., Inc., 4345 Lyndale Ave., Minneapolis, Minn. 1946
Clegg, R. R., Dist. Sls. Mgr., American Lumber & Treating Co., 332 So. Michigan Ave., Chicago 4, Ill. 1946
Collette, D. W., Fld. Engr., H. H. Robertson Co., 221 N. LaSalle St., Chicago, Ill. 1953
Colvin, C. M., Ry. Sls. Engr., Armco Drainage & Metal Prod., Inc., 7th & Parker Sts., Berkeley, Calif. 1945
Cottier, E. F., Sls., Pacific Coast Borax Co., Auburn, Ala. 1953
Cross, E. T., Vice Pres., Armco Drainage & Metal Prod. Inc., Middletown, Ohio 1946
Crowe, J. A., Mgr., Bird Tie Pads, Bird & Son, Inc., East Walpole, Mass. 1951

D

Davis, V. W., Mgr., R. R. Sls., Armco Drainage & Metal Prod. Inc., P. O. Box 1343, Atlanta, Ga. 1946
Detzel, G. E., Geo. E. Detzel Co., 2303 Gilbert Ave., Cincinnati, Ohio 1945
Devine, R. H., Asst. to Gen. Sls. Mgr., Koppers Co., Inc., 700 Koppers Bldg., Pittsburgh, Pa. 1953
Duffie, F. J., Serv. Engr., Oxweld R. R. Serv. Co., 230 No. Michigan Ave., Chicago 1, Ill. 1946

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E

Ehni, C. R., Prod. Engr., The Texas Co., 1511 So. 50th St., Kansas City, Kan. 1950
Eisenberg, A. H., Universal Engineering and Waterproofing Service, 82 Waverly Ave., Newark, N. J. 1953
Ericson, L. T., Ch. Engr., The Jennison Wright Corp., 2463 Broadway, Toledo 1, Ohio 1948
Evinger, F. W., R. R. Repr., The Patterson Sargent Co., 3243 Euclid Ave., Apt. 2-A, Berwyn, Ill. 1946

F

Farrell, J. I., Sls. Engr., Johns-Manville Sls. Corp., 13 Northern Bldg., Albany, N. Y. . . 1951
Faylor, J. D., Div. Engr., Armco Drainage & Metal Prod. Inc., 444 Ins. Exchange Bldg., Des Moines, Ia. 1946
Fields, P., Sls. Div., Detroit Graphite Co., 3228 N. Broadway, St. Louis, Mo. 1946
Filkins, A. J., Pres., Filkins & Son, Co., 9 So. Clinton St., Chicago 6, Ill. 1927
Fix, F., Dist. Sls. Mgr., Transp. Dept., Johns-Manville Sls. Corp., 1530 Guildhall Bldg., Cleveland, Ohio 1946
Flannagan, L. F., Detroit Graphite Co., 7701 W. 47th St., Lyons, Ill. 1937
Fletcher, R. L., Struct. Engr., Timber Engineering Co., 1319 18th St., N. W., Washington, D. C. 1947
Flinn, L. E., Sls. & Serv. Repr., Dearborn Chemical Co., Merchandise Mart, Chicago, Ill. 1949
Forshee, R. E., Pres., R. E. Forshee Co., Inc., P. O. Box 416, Newtown, Ohio 1951
Fox, E. A., Dist. Mgr., The Master Bldrs. Co., 80 Boylston St., Boston, Mass. 1951
Frederick, H. Z., Mgr., Ry. Sls. Div., The R. C. Mahon Co., Detroit 34, Mich. 1950

G

Gaines, H. D., 1702 Stuart Ave., Houston, Tex. 1953
Gibboney, J. L., Vice Pres., Nat'l. Aluminate Corp., 422 No. Dover St., La Grange Park, Ill. 1949
Giles, J. M., Spl. Repr., Off-Track Equip., Caterpillar Tractor Co., Peoria 8, Ill. 1938
Glassgold, I. L., Pres., Masonry Resur. & Con. Co., Inc., B. & O. Coal Pier, Baltimore, Md. 1950

H

Hall, G. E. Jr., Sls. Repr., Johns-Manville Sls. Corp., 270 Madison Ave., New York 16, N. Y. 1951
Hansen, P. O., Mgr. R. R. Sls., Armco Drainage & Metal Prod. Inc., 1516 Keith Bldg., Cleveland 15, Ohio 1952
Hickey, J. F., Pres., Baker & Hickey Co., P. O. Box 5008, Tri-Village Sta., Columbus 12, Ohio 1946
Hoelzel, W. N., Mgr. R. R. Sls., Gary Screw & Bolt Div., Pittsburgh Screw & Bolt Corp., 122 So. Michigan Ave., Chicago 3, Ill. 1949
Hoffman, T. E., Div. Mgr. & Fire Prot. Supvr., Zone Co., 917 N. Main St., Ft. Worth, Tex. 1949
Holderman, H. L., Sls. Repr., Bird & Son, Inc., 203 S. West Ave., Elmhurst, Ill. 1951
Holmberg, V. V., Vice Pres., Ellington Miller, Contractors, 25 E. Jackson Blvd., Chicago 4, Ill. 1942
Holstein, F. W., Mech. Engr., The Rails Co., 115 Observer Hyway., Hoboken, N. J. 1948
Hopkins, W. S. Jr., M. of W. Repr., Air Reduction Sales Co., 60 East 42nd Street, New York 17, N. Y. 1949

J

Jacobson, A. E., Asst. to Mgr., Oxweld R. R. Serv. Co., 230 N. Michigan Ave., Chicago, Ill. 1950

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Kalinka, J. E., Vice Pres., Roberts & Schaefer Co., 130 No. Wells St., Chicago 6, Ill....1946
Kiester, R. S., Slsman., Pacific Coast Borax Co., 503 Southern Standard Bldg., Houston 2, Tex....1950
Kirk, M. G., Salesman, Pittsburgh Screw & Bolt Corp., P. O. Box 1708, Pittsburgh 30, Pa....1948
Kluiber, F. C., John Bean Div., Food Machine & Chemical Corp., Lansing, Mich....1952

L

Lacey, J. W., Dist. Mgr., The Oxweld R. R. Serv. Co., 230 No. Mich. Ave., Chicago 1, Ill....1946
LeDuc, C. L., Field Sls. Mgr., The Acorn Refining Co., Suite 1310 - 109 No. Wabash Ave., Chicago 2, Ill....1946
Lee, R. H., Pres., Geo. Vang, Inc., 623 Grant Bldg., Pittsburgh 19, Pa....1951
Leypoldt, F., Jr., Pres., Carbolineum Wood Preserving Co., 528 W. Highland Ave., Milwaukee 3, Wis....1945
Littleton, E. J., Mgr. R. R. Sls., Jennison-Wright Corp., Granite City, Ill....1949
Lockart, E. P., Sls. Mgr., Glass Blck Div., American Structural Products Co., P. O. Box 1035 - 36, Toledo, Ohio....1951
Luther, L. A., Serv. Engr., Ingersoll Rand Co., 1121 Hamilton Ave., Palo Alto Calif....1945
Lynch, J. K., Sls. Engr., Massey Concrete Products Co., 3431 - 27th Ave. No., Birmingham, Ala....1951
Lyon, C. A., Reg. Mgr., Master Builders Co., 104 W. Huron St., Ann Arbor, Mich....1945

Mc

McDaniel, W. L., Vice Pres., Massey Concrete Prod. Co., 111 W. Washington St., Chicago 2, Ill....1945
McFarland, M., Sls. Dept., E. I. Du Pont de Nemours Co., 1616 Walnut St., Philadelphia, Pa....1952
McGehee, E. J., Vice Pres., Koppers Co., Inc., 122 So. Michigan Ave., Chicago 3, Ill....1946
McVay, G. R., Mgr. R. R. Sls. Div., The Ruberoid Co., 30 N. Michigan Ave., Chicago 1, Ill....1937

M

Mabry, D. B., Mgr. Lmbr. Sls., T. J. Moss Tie Co., 700 Security Bldg., St. Louis, Mo....1948
Mann, E. A., Pres., Champion Transportation Sls., Inc., 222 W. Adams St., Chicago 6, Ill....1951
Maurer, S. S., Western Div. Mgr., Fabreeka Prod. Co., 325 W. Huron St., Chicago 10, Ill....1952
Mayfield, P. B., Tech. Cons., Barrett Div., Allied Chem. & Dye Corp., 40 Rector St., New York 6, N. Y....1950
Mero, C. V., Mastercraft Tile & Roofing Co., No. 1 - 20th St., Richmond Calif....1949
Minton, J. H., The Minton Const. Co., 4500 Euclid Ave., Cleveland, Ohio....1946
Montgomery, H., Dist. Mgr., The Master Builders Co., 2159 Bay St., Los Angeles, Calif. 1946

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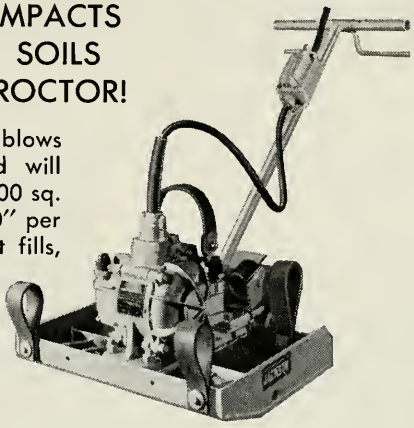

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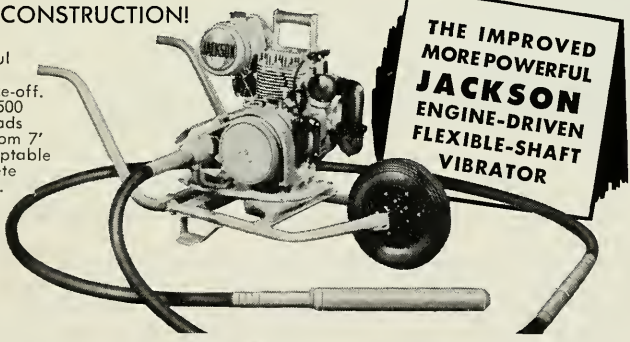

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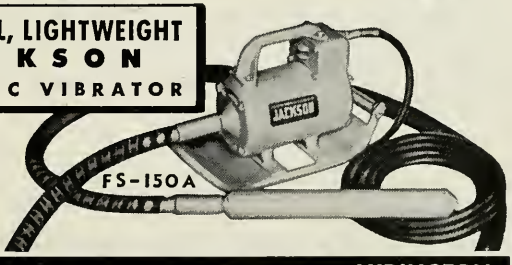

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Morris, G. J., Supvr. Serv., Electric Tamper & Equipment Co., P. O. Box 5, Cambridge, Ohio 1948
Morton, H. M., Sls. Engr., Johns-Manville Co., 1267 Architects Bldg., Los Angeles, Calif. 1945
Myers, D. R., Sls. Repr., R. R. Sls., Patterson Sargent Co., 1882 S. Normal Ave., Chicago 16, Ill. 1952

N

Needham, L. H., Pres., The Penetryn System, Inc., 2294 Scranton Rd., Cleveland Ohio .. 1946

P

Paris, G. H., R. R. Repr. Strl. & Rys. Bur., Portland Cement Assn. 33 W. Grand Ave., Chicago 10, Ill. 1945
Patterson, R., Vice Pres., Intrusion Prepakt, Inc., 80 E. Jackson Blvd., Chicago 4, Ill. 1946
Patton, R. C., Tech. Adviser, Libby Zone Co., 731 E. Kingston Ave., Charlotte, N. C. 1952
Powers, D. D., Sls. Engr., Dearborn Chemical Co., 1101 Union Central Bldg. Cincinnati 2, Ohio 1947

R

Randle, F. R., Mgr. R. R. Sls., Hardesty Div., Armco Drainage & Metal Products Inc., Box 2170, Denver 1, Colo. 1953
Redding, G. H., Pres., Massey Concrete Prod. Co., 111 W. Washington, Chicago 2, Ill. 1946
Richter, R. W., Sls. Engr., Armco Drainage & Metal Products, 310 S. Michigan Ave., Chicago, Ill. 1953
Ruhl, D. A., Indust. Engr., Ordinance Corps, U. S. Army, 11142 S. Bell Ave., Chicago 43, Ill. 1948
Ryan, P. H., Sls. Engr., Southern Amiesite Asphalt Co., P. O. Box 1390, Birmingham, Ala. 1952

S

Scott, J. M., Sls., The Arco Co., 614 Delaware St., Scranton 9, Pa. 1945
Shoop, J. W., Vice Pres., The Lehon Company, 4425 S. Oakley Ave., Chicago 9, Ill. 1945
Smith, F. C., R. R. Fire Prot. Engr., Marsh & McLennan, Inc., 231 S. La Salle St., Chicago 4, Ill. 1948
Smith, W. T., Gen. Supt., Geo. E. Detzel Co., 2303 Gilbert Ave., Cincinnati, Ohio 1950
Snow, B. S., Pres., T. W. Snow Constr. Co., R. R. Supplies, 10 W. Wilson St., Batavia, Ill. 1946
Southwick, C. E., Factory Repr., Homelite Corp., 624 S. Anderson, Los Angeles 23, Calif. 1945
Spietz, A. L., Pres., Interstate General Contractors, Inc., 5621 N. Glenwood Ave., Chicago 40, Ill. 1950
Spietz, W. P., Monarch Painting Serv., 5621 N. Glenwood Ave., Chicago 40, Ill. 1950
Stierer, G. W., Mgr. Struct'l. Steel Dept., Robt. W. Hunt. Co., 175 W. Jackson Blvd., Chicago 4, Ill. 1946
Sweitzer, R. W., Traf. Mgr., James Campbell Smith, Inc., 4057 Erie St., Willoughby, Ohio 1953

T

Thomas, P. E., Thomas Construction Engineers, 3300 Vanderbilt Rd., Birmingham, Ala. 1953
Thompson, N., Vice Pres., Homelite Corp., Port Chester, N. Y. 1946
Truss, F. W., Mgr. R. R. Sls., Armco Drainage & Metal Prod. Inc., 817 Ambassador Bldg., St. Louis 1, Mo. 1946
Twomey, J. F., Vice Pres., McCracken Contracting Co., 7340 S. Western Ave., Chicago, Ill. 1948

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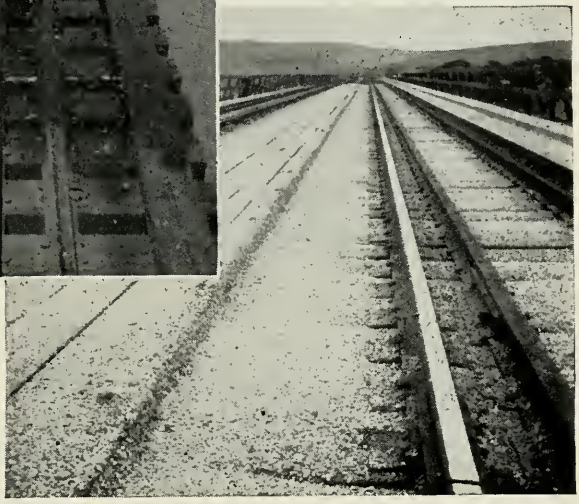

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U

Utley, O. H., Vice Pres., The Zone Co., Southwestern Petroleum Co., 917 N. Main St., Ft. Worth, Tex. 1949

W

Walters, W. R., 1535 Rand Tower, Minneapolis, Minn. 1949
Wicker, W. S., Ch. Engr., Transportation Mutual Insurance Co., 150-10th Street, N.E., Atlanta 5, Ga. 1953
Wilson, W. C., Sls. Engr., Ralph W. Payne Co., Nat'l. Met. Bk. Bldg., Washington D. C. 1951
Winters, F. T., Jr., Mgr., Agricultural Sls. Div., Pacific Coast Borax Co., P. O. Box 9128, Station "S", Los Angeles 5, Calif. 1949
Wood, B. R., Master Builders Co., 7016 Euclid Ave., Cleveland, Ohio 1937

Y

Young, R. W., Jr., R. W. Young Mfg. Co., 20 No. Wacker Dr., Chicago 6, Ill. 1946

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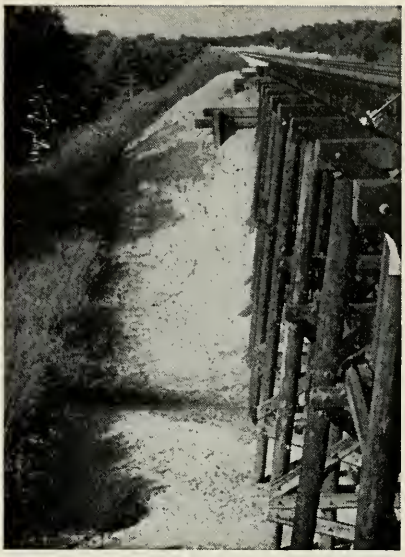

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LIST OF ANNUAL CONVENTIONS

No.	Place of Meeting	Date	Membership
1	St. Louis, Mo.	Sept. 25, 1891	60
2	Cincinnati, Ohio	Oct. 18-19, 1892	112
3	Philadelphia, Pa.	Oct. 17-19, 1893	128
4	Kansas City, Mo.	Oct. 16-18, 1894	115
5	New Orleans, La.	Oct. 15-16, 1895	122
6	Chicago, Ill.	Oct. 20-22, 1896	140
7	Denver, Colo.	Oct. 19-21, 1897	127
8	Richmond, Va.	Oct. 18-19, 1898	148
9	Detroit, Mich.	Oct. 17-19, 1899	148
10	St. Louis, Mo.	Oct. 16-18, 1900	143
11	Atlanta, Ga.	Oct. 15-17, 1901	171
12	Minneapolis, Minn.	Oct. 21-23, 1902	195
13	Quebec, Canada	Oct. 20-22, 1903	223
14	Chicago, Ill.	Oct. 18-20, 1904	293
15	Pittsburgh, Pa.	Oct. 17-19, 1905	313
16	Boston, Mass.	Oct. 16-18, 1906	340
17	Milwaukee, Wis.	Oct. 15-17, 1907	341
18	Washington, D. C.	Oct. 20-22, 1908	368
19	Jacksonville, Fla.	Oct. 19-21, 1909	393
20	Denver, Colo.	Oct. 18-20, 1910	428
21	St. Louis, Mo.	Oct. 17-19, 1911	499
22	Baltimore, Md.	Oct. 15-17, 1912	524
23	Montreal, Quebec	Oct. 21-23, 1913	570
24	Los Angeles, Cal.	Oct. 20-22, 1914	586
25	Detroit, Mich.	Oct. 19-21, 1915	665
26	New Orleans, La.	Oct. 17-19, 1916	710
27	Chicago, Ill.	Oct. 16-18, 1917	704
28	Chicago, Ill.	Oct. 15-17, 1918	716
29	Cleveland, Ohio	Oct. 21-23, 1919	776
30	Atlanta, Ga.	Oct. 26-28, 1920	840
31	New York, N.Y.	Oct. 18-20, 1921	850
32	Cincinnati, Ohio	Oct. 17-19, 1922	865
33	Seattle, Wash.	Oct. 16-18, 1923	846
34	Kansas City, Mo.	Oct. 21-23, 1924	837
35	Buffalo, N.Y.	Oct. 20-22, 1925	759
36	Richmond, Va.	Oct. 12-14, 1926	750
37	Minneapolis, Minn.	Oct. 18-20, 1927	754
38	Boston, Mass.	Oct. 23-25, 1928	755
39	New Orleans, La.	Oct. 15-17, 1929	755
40	Louisville, Ky.	Oct. 21-23, 1930	713
41	Chicago, Ill.	Oct. 16-18, 1934	592
42	Chicago, Ill.	Oct. 15-17, 1935	547
43	Chicago, Ill.	Oct. 20-22, 1936	588
44	Chicago, Ill.	Oct. 19-21, 1937	566
45	Chicago, Ill.	Oct. 18-20, 1938	589
46	Chicago, Ill.	Oct. 17-19, 1939	546
47	Chicago, Ill.	Oct. 15-17, 1940	610
48	Chicago, Ill.	Oct. 14-16, 1941	594
49	Chicago, Ill.	Oct. 20-22, 1942	618
50	Chicago, Ill.	Oct. 20-21, 1943	597
51	Chicago, Ill.	Sept. 17-19, 1946	698
52	Chicago, Ill.	Sept. 16-18, 1947	651
53	Chicago, Ill.	Sept. 20-22, 1948	652
54	Chicago, Ill.	Sept. 12-14, 1949	676
55	Chicago, Ill.	Sept. 18-20, 1950	713
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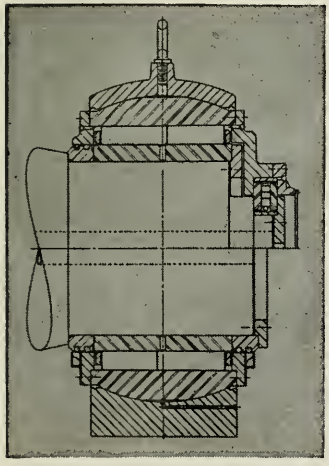

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